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RURAL STORAGE AND COLLECTION CONTAINER
SYSTEMS

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Humboldt County Department of Public Works

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Environmental Protection Agency
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This report describes the development and financing of a county solid waste collection system for rural areas. The objective of the system was to substitute an environmentally sound method of solid waste disposal for the unsound practice of using small, random, burning dumps. The report shows that this can be accomplished. It presents a detail description of the storage and collection containers used, the construction of the container sites, and an economic analysis of the advantages/disadvantages of the use of small and large containers. The report also presents a comprehensive analysis of the development of the County financial plan.

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RURAL STORAGE AND COLLECTION
CONTAINER SYSTEMS

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U.S. ENVIRONMENTAL PROTECTION AGENCY

1975

1 a

HUMBOLDT COUNTY SOLID WASTE DEMONSTRATION PROJECT

FINAL REPORT

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These plates are not included in this text, but are available for review and copying at EPA Office of Solid Waste Management Programs, Washington, D.C.

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SUMMARY

Humboldt County is located along the scenic Pacific Coast of Northern California. Typical of many rural areas in the Pacific Northwest, the County economy depends heavily upon the forest products industry. Of the approximately 100,000 people in the County, 87 percent reside in an urban or semi-urban corridor where solid waste collection service is available to them through franchised private haulers. The other 13,000 people live in remote, relatively isolated areas centering around small communities. Historically, these communities have delivered their solid waste material to convenient open dumps that were periodically burned by the community or under the supervision of the Humboldt County Department of Public Works. The project described in this report was prompted by the recognition of the liabilities associated with this method of solid waste disposal, including such matters as air pollution, water pollution, aesthetic blight, fire hazard to surrounding forests, and health and sanitation hazards from vector breeding.

As an alternative to the open burning dumps, it was proposed that rurally located sites be developed where steel containers could be placed to receive the solid waste previously delivered to the open dumps. The containers would then be emptied periodically by a special collection vehicle, and the solid waste brought to a central sanitary landfill for proper disposal.

At an early date it became apparent that very little information was available to assist in the design and implementation of such a system for rural solid waste management.

The demonstration program was established, with partial funding from the U. S. Environmental Protection Agency, to develop and document the operational characteristics of a containerized collection system where numerous design features could be varied to test their effectiveness. At the heart of the demonstration program was the testing of two alternate concepts for container collection of solid waste in a portion of the County. A 40-cubic-yard roll-off container was located at some sites. At others, five 8-cubic-yard containers were located, which were serviced by a 42-cubic-yard front-loading compactor vehicle. During the 17-month operational phase of the project, detailed data was accumulated which related to the collection and disposal activities. Analysis of this data, firmly supported by field observations and practical experience, has led to conclusions upon which the design and implementation of a County-wide container collection system will be based.

Although there appears to be a very modest cost advantage to the 8-cubic-yard system over the 40-cubic-yard system (based upon equivalent tonnages, the costs are \$39.73 per ton versus \$42.92 per ton), the 40-cubic-yard system is recommended because of its more effective performance with respect to (1) its ability to handle over-sized, bulky items, (2) better

control of environmental and aesthetic considerations, (3) increased equipment reliability, and (4) site user preference. Comparison of either container system to the old system of open burning dumps has shown the virtual elimination of or significant reduction in, items generally associated with such waste disposal sites as air pollution, water pollution, land blight, poor sanitation conditions, and fire hazards.

A central landfill was established in the southern portion of the County to dispose of waste from the container system, the franchised collectors, and the State Parks. During the course of the project the average waste quantity was approximately 11 tons per day and the actual disposal cost was \$14.55 per ton. At such a small landfill, the refuse-to-cover ratio was approximately 1:1, instead of the originally anticipated 3:1. As a result, the anticipated 20-year life of the disposal site was reduced to 7 or 8 years. The landfill operation was a difficult component of the project due to (1) the long delayed issuance of waste discharge requirement by the North Coast Regional Water Quality Control Board, (2) initial shortages of manpower necessary to properly maintain the site, and (3) less than ideal ground-water conditions at the site. During the last month of the project, the landfill access road was a victim of earthslides caused by heavy winter rains, effectively closing the site due to inaccessibility. Attempts will not be made to reopen the site with a permanent road; rather, a transfer station will be developed to deliver waste to a disposal site in the mid-County area.

Although the container system has proved to be costly, it is an effective alternative for management of rurally generated solid waste in an environmentally sound manner. Based upon information developed during the demonstration project, the container system will be expanded County-wide. Fourteen container sites will ultimately be operated, permitting the closure of approximately 20 open burning dumps. This system of container sites, in conjunction with larger transfer stations, will permit focusing all of the waste in the County at a single location where it may be properly disposed of by sanitary landfill, or at some future time, processed for reclamation of the waste's valuable components. The container system has proved to be so effective that it has served as the basis for implementation of similar programs in other Northern California and Oregon counties.

INTRODUCTION

Humboldt County is located in Northern California along the Pacific Ocean some 250 miles north of San Francisco. The developed portion of the County stretches in a north-south corridor centered around U. S. Highway 101. The balance of the County is predominately rural with small population centers widely scattered throughout the 4,500 square mile area. These communities are relatively isolated, with access provided by narrow, winding roads traversing the rugged terrain.

The County economy has a strong dependence upon the forest products industry and tourism. The outdoor beauty and magnificent, virgin redwood stands are a strong attraction for summer vacationers. Within the County are major National and State Parks and numerous recreational areas and campgrounds.

Of the 100,000 people in the County, approximately 87 percent live in the developed corridor, within franchised solid waste collection areas. The remaining 13 percent, or 13,000 people, live in or around the small communities in the rural areas. The traditional method of solid waste management in the rural areas had been individual delivery of materials to a small dump that was periodically burned off. In 1971 the County operated and maintained over 27 disposal sites within the area. At that time the quantity of waste requiring disposal was estimated to be 61,900 tons per year, escalating to 91,800 tons per year in 1985. The County's ability to adequately service the disposal sites on more than an intermittent basis was limited by financial, manpower, and equipment constraints. Consequently, the situation (typical of most rural counties) resulted in dump sites that present fire hazards, fly and rodent infestation, smoke and odors, surface water pollution, and aesthetic blight.

It was from this background that efforts were initiated to seek alternate methods to upgrade solid waste management in the County. The evolution of this effort began in 1969 with the preparation of a report, Solid Waste Disposal for Rural Communities - 1970, by the Humboldt County Department of Public Works. Assisting in preparation of the report were the California State Department of Health and the consulting firm of Garretson•Elmendorf•Zinov•Reibin, Architects and Engineers. The study was partially supported by Demonstration Grant Number G06-EC-00138 from the Office of Solid Waste Management Programs, U. S. Environmental Protection Agency. The major thrust of this effort was to review and evaluate the three alternate methods to deal with the rurally-generated solid waste:

- (1) Modified Landfill System: The existing dumps serving the rural communities would be replaced by a disposal site at a different location which would be covered on a weekly basis by mobile crews.

- (2) **Forty-Cubic-Yard Container System:** A container site, consisting of a concrete retaining wall, a concrete slab to support the container, and asphalt paving for access by the collection vehicle and site users, would be developed at each existing dump site. A collection vehicle, capable of mounting the container on the truck bed, would pick up the container and deliver the waste to a centrally-located sanitary landfill. Area residents would deliver their waste to the container as they had previously done to the dump.
- (3) **Eight-Cubic-Yard System:** The container site would be developed in a manner similar to the one for the larger containers. Several of the 8-cubic-yard containers would be located at the site for use by area residents. A collection vehicle, fitted with a front-loading compaction body, would empty each container and return it to its position at the site. Due to the compaction ability of the vehicle, numerous containers and several container sites could be serviced during a single route trip from the landfill.

The feasibility study recommended the use of a container system over the modified landfill approach. It was concluded that the modified landfill concept had higher operational costs and would not meet minimum anticipated state and federal solid waste disposal requirements. The system's low capitalization requirements and user reeducation advantages were not sufficient to balance the detrimental environmental effects of "upgraded dumps". The study also recommended that the County embark on a comparative evaluation program relating to the operational and functional characteristics of the 8-cubic-yard and 40-cubic-yard containerized storage and collection systems utilizing a central sanitary landfill for final disposal.

The County committed itself to implementing these recommendations with partial financial support from the Office of Solid Waste Management Programs, U. S. Environmental Protection Agency, Demonstration Grant Number G06-EC-00271. The specific objectives of the demonstration project were to:

- (1) Test the effectiveness of a containerized storage and collection system in reducing the fire hazards, public health hazards, air and water pollution, general unsightliness, and aesthetic objections arising from existing practices in typical small, rural, isolated communities.
- (2) Develop comparative engineering data relating to the operational and functional characteristics of the 8-cubic-yard and 40-cubic-yard containerized storage and collection systems.

- (3) Delineate the advantages and disadvantages of the various site configurations, and ascertain the influence or effect of the ancillary variables (public preferences, public convenience, site maintenance, spillage, etc.) on the economics or practicability of the total system.
- (4) Demonstrate the feasibility of an integrated solid waste storage, collection, and disposal system as a viable economic alternative to the existing system of numerous open dumps.
- (5) Investigate alternative and/or unique sources of revenues and methods of financing the proposed system throughout the County that are available to rural areas but heretofore have not been utilized or applied to a project of this nature.
- (6) Select the optimum system based on the above factors for County-wide implementation and design appropriate systems and components.
- (7) Disseminate all the generated information, data, operational experience, and conclusions, to all concerned regional solid waste management personnel, County and public officials, or other interested parties, through a series of short one-day practical seminars to be held periodically throughout the course of the project.

Equipment acquisition, container site construction, and landfill acquisition and design, were all completed by July 1972. These components of the project are described in detail in an interim project report, Rural Storage and Collection Container Systems, National Technical Information Service Publication PB-212-398, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151. On August 1, 1972, the system became operational, and data relating to the characteristics of the system has been collected since that date. This report briefly summarizes the design and implementation information found in the earlier interim report, and presents the results and conclusions developed during the 17-month operational period of the demonstration project.

✓ The project was conducted under the overall management of the Humboldt County Department of Public Works. Technical guidance was provided by Garretson•Elmendorf•Zinov•Reibin, Architects and Engineers; Bartle Wells Associates, Municipal Financing Consultants, provided assistance with the financial plan for the system. Interdepartmental coordination, citizen input, and project review were provided by a project advisory committee; its members consist of representatives from the following organizations:

- California State Department of Health
- League of Women Voters
- California Division of Forestry
- California State Department of Parks and Recreation
- Humboldt County Air Pollution Control Board
- Humboldt County Department of Environmental Health
- The Times Standard Newspaper

CHAPTER 1: CONCLUSIONS

1.1 CONTAINER SIZE

The 40-cubic-yard container system has proved superior to the 8-cubic-yard container system in the following respects:

- The 40-cubic-yard container can accept virtually all wastes delivered to the site, including bulky, over-sized items.
- The 40-cubic-yard containers achieve slightly higher waste densities, and consequently, greater capacity.
- As a corollary to the above, the overflow, litter, spillage, and presence of vectors at the 8-cubic-yard container sites are greater than at the 40-cubic-yard sites, and hence both visual and sanitary conditions are generally better at the latter sites.
- The consistent overload characteristics of the compactor body and problems inherent in the compaction equipment have caused greater downtime and maintenance.
- Site users prefer the 40-cubic-yard containers to the 8-cubic-yard containers.

1.2 OPERATING COSTS

1.2.1 CONTAINERS

During the entire project, the unit collection cost for the 40-cubic-yard system was \$42.27 per ton (based on 857 tons collected) and for the 8-cubic-yard system, \$44.68 per ton (based on 683 tons collected) (Table 5). Based on the same tonnage of waste collected by each system during the first ten months of operation (approximately 445 tons), the unit costs were \$39.73 per ton for the 8-cubic-yard system and \$42.92 per ton for the 40-cubic-yard system.

1.2.2 SANITARY LANDFILL

The Benbow Landfill receives an average of approximately 11 tons of solid waste per day, with a seasonal increase of approximately 100 percent between the winter and summer months. The actual disposal cost during the Demonstration Project Period was \$14.55 per ton (Appendix C). These high costs are principally due to the inherent inefficiencies of operating a disposal site receiving less than 11 tons per day.

1.2.3 COLLECTION VEHICLES

The collection vehicle cost (exclusive of the 42-cubic-yard compaction body) was \$0.82 per mile: \$0.34 per mile, operation and maintenance; \$0.19 per mile, depreciation; and \$0.29 per mile, vehicle driver (Appendix G and Table 5 respectively).

1.3 OPERATING CONCLUSIONS

Although only a portion of the site users made the effort to close the container lids, the lids are justified by their positive effect on fire, leachate, and litter control.

The top of the containers should be approximately 16 inches above the dumping platform to minimize wall height and still permit direct dumping from a pick-up truck.

A refuse-to-cover ratio of 1:1 to 2:1 should be expected at low volume landfills such as Benbow where daily waste quantities are less than 10 to 15 tons.

The heavy-duty chassis and over-sized equipment on the existing collection vehicles is necessary to negotiate the rugged terrain in Humboldt County.

Although vandalism has occurred at some of the container sites, their functional reliability has not been affected.

Weekly container collection, proper site clean-up, and periodic container washing reduce the presence of vectors at the site to a minimal and acceptable level, but do not eliminate them.

1.4 EXPANSION OF SYSTEM

The container collection system, to be expanded County-wide, will employ the following features:

- Forty-cubic-yard containers, or larger, with lids will be used exclusively throughout the County.
- A collection vehicle with a trailer will be utilized to permit servicing two 40-cubic-yard containers in a single route trip.
- The rural container site design will be modified to permit dropping off an empty container and loading a full container without having to use the collection vehicle to push the containers into the proper position.
- A 5- to 6-mile and/or 10- to 15-minute haul radius will be utilized as the effective design criteria for the container sites.

- The Benbow Sanitary Landfill will be replaced by a transfer station that will deliver future waste from the Demonstration Project Area to a single County-wide disposal site in the mid-County vicinity.

CHAPTER 2: COLLECTION SYSTEM DESIGN AND IMPLEMENTATION

2.1 DEMONSTRATION PROJECT PROGRAM DESIGN

For the purpose of evaluating the relative performance of the two types of container systems, the southern third of the County was designated as the Demonstration Project Area (Figure 1). It contains 16 unincorporated communities, ranging in size from 150 to 1,100 persons. The approximate total population for this area is 10,000 persons. The area is presently serviced by two franchised collectors, operating principally in the Garberville and Myers Flat areas along a narrow corridor paralleling the principal highway transversing the area. The terrain is mountainous with limited access to the rural communities; highway grades are in excess of 20 percent at some locations (Plates 1 and 2). The two collectors provide regular service for approximately 1,300 persons. The area contained 11 open dumps; of these, one was owned and maintained by the County; five were owned privately, but maintained by the County; two were owned and maintained by private individuals; one was owned and maintained by the State Department of Parks and Recreation; and two were owned privately and not maintained.

Six container sites were constructed in this portion of the County. A landfill was developed in the Garberville vicinity to serve the container system and the franchised collection areas. Three container sites (Fruitland, Blocksburg, and Alderpoint) were located east of the highway, and three container sites were located west of the highway (Thorn, Shelter Cove, and Petrolia) (Figure 1). At the beginning of the Demonstration Project, 8-cubic-yard containers were located at the sites to the east, and 40-cubic-yard containers were located at those sites to the west of Highway 101. For each type of container system, two additional variables were introduced to determine their effect on the operational characteristics: (1) The top of the container was at the same height as the dumping platform, or 30 inches higher, and (2) the containers at some sites were fitted with lids, and at all others they had no lids.

The testing program called for in the Demonstration Project included a 6-month period when data could be collected on the container systems arranged as described in the preceding paragraph. A second 6-month period would be devoted to such things as varying the collection frequency, fire suppression tests, alternate vehicle uses, vector investigations, site user surveys, evaluation of liquid effluents, and placement of both container types at a single site. During a third 6-month period, the 8-cubic-yard and 40-cubic-yard containers were to be interchanged at each site. In this fashion, the performance of a 40-cubic-yard container at a specific site could be compared to the performance of an 8-cubic-yard container at the same site. Although this schedule has not been strictly adhered to, the basic objectives have been achieved as will be discussed in later sections.

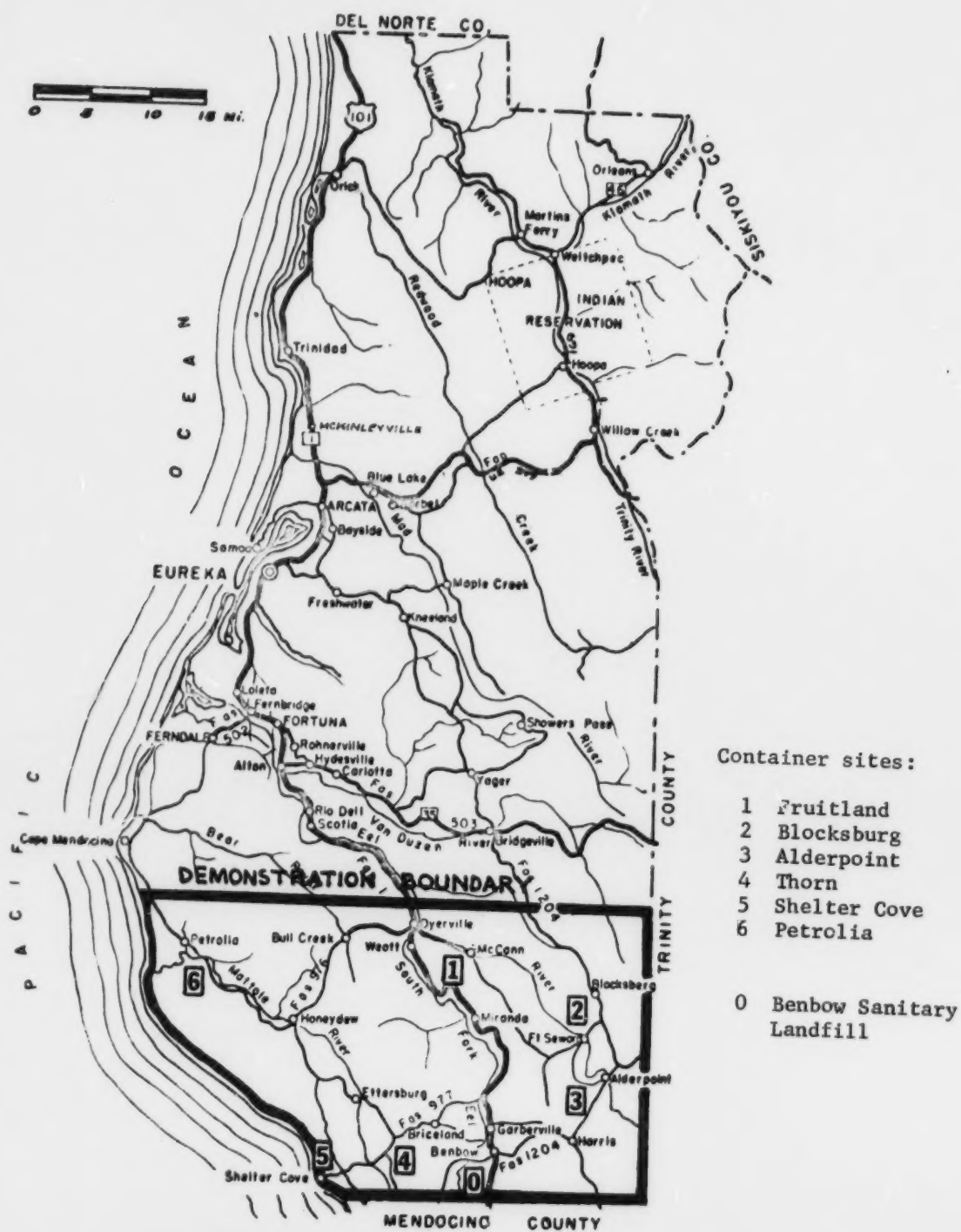


Figure 1. Humboldt County, California. Solid Waste Demonstration Project Area.

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2.2

CONTAINER SITES

Four of the container sites were located at existing dump sites serving the area. These land parcels were privately owned and leased to the County, and the owners readily agreed to replacing the dumps with the container sites. The Alderpoint and Thorn sites were located on parcels not previously used for solid waste disposal. Lengthy negotiations with owners were required in order to acquire the necessary land, delaying the design and construction of the sites.

Each site is capable of handling one 40-cubic-yard container or five 8-cubic-yard containers (Figure 2). Considerable design effort was required to work out the maneuvering procedure for unloading the empty 40-cubic-yard container, loading the full one, and then pushing the empty one into position next to the retaining wall with the lids opening in the correct direction. The vehicle maneuvers necessary to service the 8-cubic-yard containers were superimposed upon those maneuvers required for the 40-cubic-yard containers to derive the configuration of the lower level of the container site (Plate 3).

In order to provide different elevations of the containers above the dumping platform (upper level), the retaining wall height was not the same for all container sites, but was either 5 ft 6 in. or 8 ft 0 in. Both the retaining wall and the platform on which the containers rest are constructed of cast-in-place reinforced concrete. The other paving at the site is asphaltic concrete (Plates 4 and 5).

Surveys, final design drawings, and bid documents were completed for the six sites by the early summer of 1971. An initial bid opening in mid-summer showed the low bid of \$207,295 to be almost 80 percent over the budgeted amount. The project was readvertised and the contract awarded to the low bidders for the total amount of \$169,201. Although construction began in the fall of the year, it was anticipated that it could be completed before inclement weather. Early storms, however, necessitated a winter shutdown and construction was not concluded until the early summer of 1972.

2.3

COLLECTION EQUIPMENT

The very nature of the Demonstration Project necessitated acquisition of a collection vehicle capable of servicing a 40-cubic-yard roll-off container and of mounting a front-loading compaction body to service 8-cubic-yard containers. Additionally, the vehicle must be capable of negotiating the severe topography of the County on narrow, winding roads with a solid waste payload that makes the vehicle fall within the legal highway weight limitation in California. Each component of the collection equipment must be compatible with

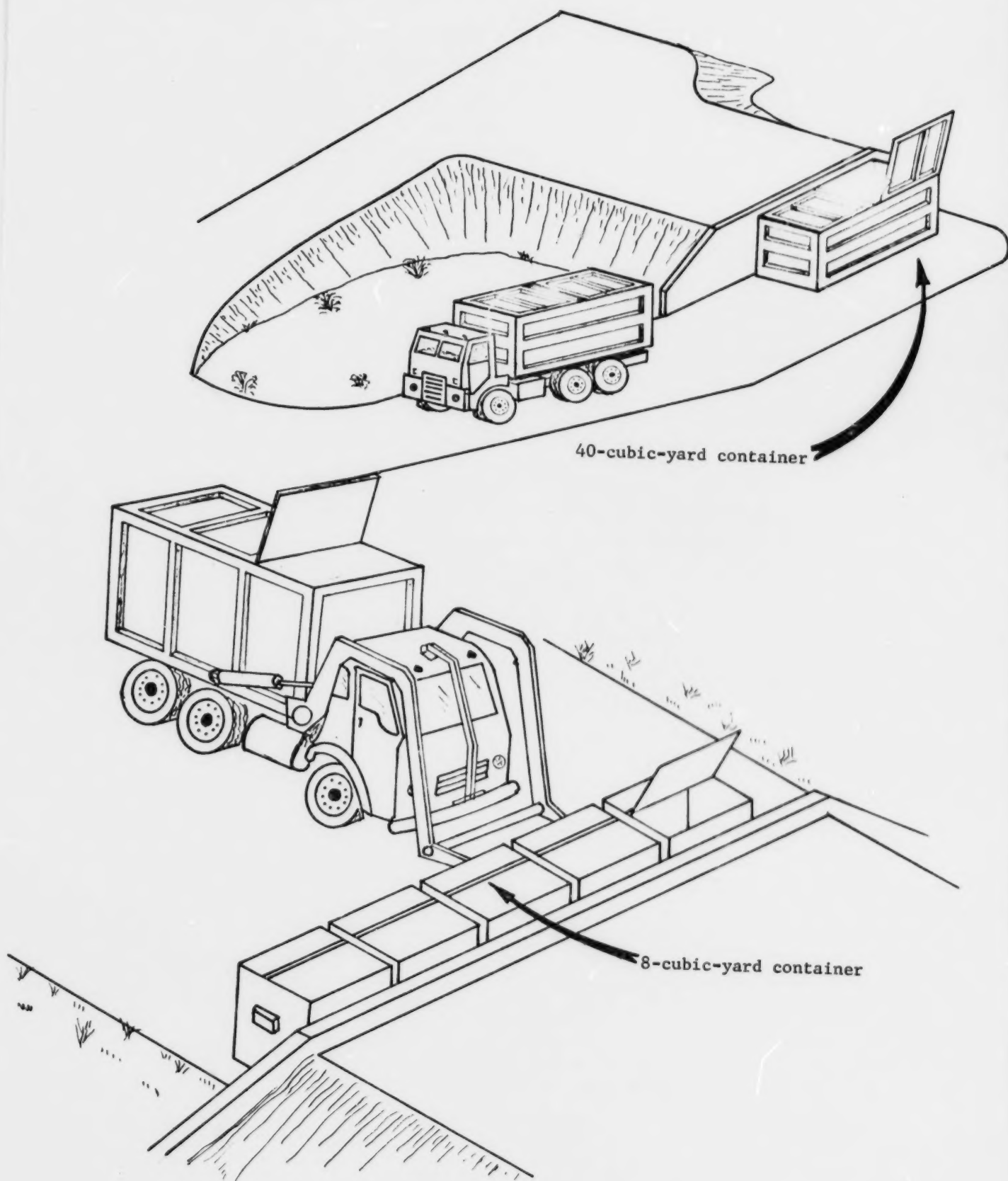


Figure 2. Conceptual drawing of truck, containers, and site for utilizing the 8- and the 40-cubic-yard container systems.

the others and capable of meeting the performance requirements inherent in the project.

Field demonstration of a medium-sized truck chassis with a simulated waste load showed that it was not adequate for the demanding task of the project. On several 15- to 20-percent grades on the route between Garberville and Shelter Cove, the engine rpm dropped to 1,500 in low gear with an indicated speed of less than 3 miles per hour. Engine heating and brake fading were prevalent on several grades; brake fade on a long downgrade into Shelter Cove terminated the run for safety reasons. This test confirmed speculation by the project staff and dictated that the truck chassis be heavy-duty to accommodate an engine in the 300-horsepower range and a Jacobs engine brake (Appendix A). This type of chassis is not normally used in combination with a front loading compaction body due to its large cab, and special attention was required to effect the proper marriage between the two (Plate 6).

The ability of manufacturers and dealers to bid on the front-loading compaction body was restricted by the compatibility of their equipment with the heavy-duty chassis. Accurate truck chassis specifications were necessary to determine such things as compatibility of front-loading arms with cab and maximum payload based on axle loading. Both the project team and prospective compaction body bidders experienced difficulty in securing unqualified reporting of critical truck specifications.

Container specifications were based upon standard designs to keep the costs within a reasonable range. Some modifications, however, were necessary to conform to the project objectives. In order for the 8-cubic-yard containers to be the same height as the 40-cubic-yard drop boxes, steel "stilts" were fixed to the bottom. This modification has not affected the containers' stability at the site, nor the ability of the collection vehicle to service them. Three of the 40-cubic-yard drop boxes were fitted with a solid steel, split lid, with spring counterbalancing to open with an applied force of five pounds (Plate 7). Although the 8-cubic-yard containers with lids are similarly spring loaded to facilitate opening, this feature is already available in many standard designs. Two 20-cubic-yard drop boxes, without lids, were also acquired to provide a margin of extra capacity should unforeseen difficulties develop in the overall program (Plate 8). These containers turned out to be essential to the program, as will be detailed in a later section.

To give the truck chassis the capability of mounting the compaction body or drop boxes, a hydraulic tilting-frame understructure is mounted on the truck bed. This piece of equipment is available with a cable and winch or with a hydraulic, telescoping piston pull-on system. The two understructures acquired for the collection vehicles employ the winch and cable system.

Total acquisition cost for the collection equipment was approximately \$99,000 (Table 1).

TABLE 1
SUMMARY OF BID AWARDS

<u>Waste collection equipment:</u>	
<u>Base items</u>	<u>Cost</u>
Understructure (2)	\$ 9,445.46
42-cubic-yard detachable compaction body and front loader (1)	12,319.09
40-cubic-yard drop boxes (5)	12,990.00
20-cubic-yard drop boxes (2)	3,912.00
8-cubic-yard drop boxes (20)	8,500.00
	<u>\$ 47,166.55</u>
<u>Optional items</u>	
Wash water system (1)	300.00
Outside controls (2)	264.00
Double-ended understructures for 40-cubic-yard drop boxes	875.00
Alternate partial-pack compaction body in lieu of standard full pack (1)	(900.00)
	<u>\$ 539.00</u>
5% sales tax	2,385.28
	<u>2,385.28</u>
Total purchase price	<u>\$ 50,090.83</u>
<u>Truck chassis:</u>	
Truck chassis - International Model No. COF 4070A (2)	\$ 45,624.88
Air conditioner (2)	763.04
5% sales tax	2,319.40
	<u>2,319.40</u>
Total purchase price	<u>\$ 48,707.32</u>
	<u><u>\$ 48,707.32</u></u>
Total waste collection equipment and truck chassis awards	<u>\$ 98,798.15</u>
	<u><u>\$ 98,798.15</u></u>

CHAPTER 3: DISPOSAL SITES

3.1 CLOSURE OF DUMPS

Seven open burning dumps were identified for closure in the project area. Six of the sites were maintained as authorized sites by the County (Plate 9).

Dump sites adjacent to proposed container sites were reviewed prior to final project design to insure that construction would not prevent public use of the existing dumps until the program was implemented. Contract documents also included provisions to stockpile surplus material for dump site closure.

Each site was reviewed prior to program implementation by project and maintenance personnel to determine closure procedures. Road department and dump maintenance personnel were used to perform all field closure work. Right-of-way personnel arranged for entry permits for those sites maintained by the County that did not have adequate lease provisions.

Field activities to close the majority of the dump sites were initiated about one week prior to program implementation and were completed subsequent to program implementation (Table 2). General closure steps included:

- Complete burning of accumulated waste by dump maintenance personnel.
- Waste compaction and covering with on site material by road personnel.
- Construction of fences, barricades, and posting signs to prevent further use.
- Subsequent review to identify and complete additional work.

The final covering at the Garberville site will be performed when the Garberville container or transfer site is constructed. Closure steps for the Harris site were recently determined to be the property owner's responsibility and County action for final cover of this illegal site has not been initiated. Specific rat eradication procedures were not deemed necessary after preliminary review by appropriate vector control agencies.

TABLE 2

DUMP SITE CLOSURE INFORMATION

	<u>Alderpoint</u>	<u>Blocksburg</u>	<u>Fruitland</u>	<u>Garberville</u>	<u>Harris</u>	<u>Petrolia- Honeydew</u>	<u>Thorn</u>
Site adjacent to container site		X	X			X	
Provision made for public use during construction		X	X			X	
Provision made to stockpile surplus material		X	(1)			X	
Site entry permit required for closure	X	X	X		(2)		X
Site fencing required	X			X			X
Site closure signs required	X			X	X		X
Date initial closure completed	(3)	(3)	(3)			(3)	(3)
Follow-up site inspection made	X	X	X	X	X	X	X
Added site work required				(4)	(5)		

(1) No surplus material available.

(2) Site closure has been determined to be the property owner's responsibility.

(3) June 1972.

(4) Final cover requirements to be met with surplus material when the Garberville container site is constructed.

(5) County action for final cover by property owners is still pending.

3.2 CENTRAL LANDFILL - BENBOW

3.2.1 PROPERTY ACQUISITION

Representatives of the Department of Public Works had hoped to establish a program to reduce the impact of public opposition in the final selection of a suitable landfill site. The approach used by the Department was to locate parcels that were (1) within the geographical area, (2) suitable for development, and (3) available to purchase for this purpose. This approach was taken because the County did not have the right of immediate possession of property through condemnation for solid waste purposes. Indications were given that in excess of one year would be required between court actions and final possession, which would substantially delay project schedules.

The acquisition of the central landfill was one of the major delaying factors in the project. The following paragraphs describe the selection criteria used, the difficulties in locating a parcel, and the access restrictions on the selected parcel.

- Selection Criteria. The general geographic area of the project was mountainous. Population was centered in the Garberville-Redway area. These two factors limited both the general area where the central landfill could be located and the acreage of land within the area that would be suited for a landfill.

An 8-mile radius around the Garberville-Redway area was selected as the basic criteria for site selection. The reasons for this general location limitation were:

- (1) A landfill in this area would serve the recreational needs and franchisee requirements, as well as the proposed collection system.
- (2) Roads to the container sites connect to Highway 101 in the Garberville-Redway area.
- (3) The Garberville area was the center of population and contained the existing and proposed commercial developments.

An added location criterion placed emphasis on parcels within a one-half mile distance from access points on state or county maintained roads. An access road one-half mile long would require \$50,000 to develop; a maximum access cost in relation to acquisition costs. The development cost for the access road was based on an 18-foot roadway in moderate terrain; property acquisition was estimated at \$2,000 per acre.

Sites with distances greater than the specified eight-mile criterion were considered marginal.

Initial site evaluations were limited to parcels greater than 35 acres which was the minimum acreage required for a 25-year landfill service life. Smaller and adjacent sites under separate ownership were not initially considered because on-site surveys and site options would be more difficult to obtain.

- Site Evaluation. Criteria for site evaluation included:
 - (1) View from existing roads.
 - (2) Suitable geological conditions and soil characteristics. Canyon areas would be suitable if stream and / or surface waters could be diverted, and if the perimeter fill slope of the landfill were no greater than 4:1.
 - (3) Land reclamation benefits.
- Procedure for Site Evaluation. Office investigations and field reviews for the landfill site were initiated prior to project funding. The following procedures were used for initial site evaluations:
 - (1) Aerial photographs and timber appraisal maps were reviewed for potential sites.
 - (2) Field reviews were made to visually evaluate site suitability.
 - (3) Letters were forwarded to owners indicating the need for a central landfill, landfill operating concepts, and the need for a response on the owners' willingness to discuss further evaluations of the property identified as a potential site.

Initial contacts with owners of identified parcels and the majority of realtors in the southern County area had been made by the fall of 1970. No potential sites meeting owner approval were found through combined efforts by the County and local realtors.

After additional field evaluations, the Department of Public Works initiated action for geological evaluations of a site adjacent to the existing Garberville dump. The Department also prepared a site location map to assess all identified potential parcels within the proposed area. The site location map served as a visual assessment of all parcels within the geographical

area, and included overlays, a color code, and other information for illustrating (1) areas within reasonable access of existing roads; (2) eliminated parcels (less than 35 acres of land, community sites, and other developed areas); (3) ownership of remaining parcels.

The Department made no attempt to assess the geological conditions of any area unless the owner agreed. All acquisition steps between January and March were limited to re-evaluation of possible sites and continued negotiations with the owner of land adjacent to the existing dump.

The County of Humboldt evaluated and accepted a lease-purchase option offered by a landowner for a 40-acre parcel in the Benbow area. This action was taken because (1) negotiations on the parcel adjacent to the existing dump were terminated due to lack of agreement and (2) the efforts to locate alternate sites between January and May were unsuccessful.

Acquisition steps on this property had proceeded sufficiently by the first of June to allow project continuance. Initial geological evaluations and a lease on the proposed parcel insured the central landfill development, and enabled the County to award equipment bids and container site construction contracts.

- Access Restrictions. The acquisition steps for the central landfill parcel were to be completed prior to lease termination. Acquisition terms were included in an agreement between the owner and County, subject to final hearings.

The access road to the site was about one mile long. The road was indicated to be under the same ownership as the parcel to be acquired. During subsequent public hearings and acquisition steps it was determined that:

- (1) The parcel boundaries were different from those indicated by existing fences and structures. Resolving the discrepancies would require an agreement or legal decision between the owner and adjacent property owners.
- (2) Ownership and access rights for the access road were also unclear and subject to agreements on a legal decision between the parties.
- (3) The owner of a large historical tourist inn objected to the proposed public traffic that would pass the inn prior to entering the access road.

The County, after additional meetings and hearings, executed agreements to acquire the property and access road after the two owners signed agreements resolving the ownership rights of the property and access road. The County accepted a condition that only vehicles authorized by the County could enter the site and that general public access would not be allowed until after the landfill operation was terminated. The County accepted the access restriction as a part of the agreement because of the need to acquire the site within a limited time frame to continue the project (Plate 10).

3.2.2 SITE DEVELOPMENT

As part of the effort to utilize the disposal site in a rational manner, a limited soils and geological investigation and topographic mapping were completed in 1971. Due to concern about the stability of the bluff overlooking the south fork of the Eel River, the entire landfill operation was to be "setback" from the bluff by 200 feet. The site master plan called for the successive construction of three trenches, each intercepting bedrock, approximately 10 to 20 feet below ground level. Trenching provides: (1) material which can be stockpiled for final cover and other use, (2) the starting point for the progressive excavation of each operational phase, and (3) an interceptor and collector system for subsurface seepage and potential leachates. The trenches were to be located so that they would open into a drainageway through the center of the site. As the landfill developed, all off-site surface drainage would be diverted around the working area and down the eastern boundary of the site. The drainageway through the site would serve as a natural trunk collector, at the bedrock level, for subsurface seepage from each trench. Based upon a 3:1 refuse-to-cover ratio and an annual solid waste quantity of 4,500 tons in 1972, escalating to 6,000 tons per year in 1980, the site life was estimated to be 23 years.

An abandoned 60-foot by 80-foot corrugated metal building with concrete slab floor was located on the site. With minor modifications, it was adapted for use for equipment storage, minor equipment maintenance, and to house the truck scale weighing apparatus. Portable truck scales were installed to weigh all solid waste deposited at the site.

Access to the site was originally provided by an unimproved, one-lane road constructed when the site was used as a lumber mill. The County graded and graveled the approximately one-mile long road to provide improved access to the site.

3.2.3 REGIONAL WATER QUALITY CONTROL BOARD REQUIREMENTS

In compliance with the State of California regulations, the plans and specifications for the Benbow Landfill were submitted to the North Coast Regional Water Quality Control Board (RWQCB) for their approval prior to commencing operation at the site. During the following months, there was no response from the RWQCB. The landfill operation finally began in July 1972, without the issuance of waste discharge requirements by the RWQCB. During the fall of 1972, correspondence between the County and the Water Quality Control Board centered around several concerns:

- (1) The County desired prompt issuance of the waste discharge requirements so that they would have authorized guidance in terms of which operational procedures to employ in the site development. Specifically, if the Regional Board prohibited excavation of the trenches all the way to bedrock to reduce the potential for contact with groundwater, then the site development plan would have to be altered to provide for waste disposal at, or near, grade.
- (2) The Regional Board was concerned that significant quantities of leachate would be generated due to the heavy rainfall during the winter and the resultant subsurface flow through the site at the bedrock level.
- (3) The available technology to economically treat any potential leachate generated is developmental and essentially untested in field conditions. Neither the County nor the Regional Board had clear concepts for effectively treating potential leachate.

During this period of time, both the State Water Resources Control Board and the County consultant entered into the discussions surrounding the problems created by the delay in issuance of the waste discharge requirements and the problems inherent in the site itself. On February 28, 1973, the North Coast Regional Water Quality Control Board finally adopted waste discharge requirements for the Benbow Landfill. The most important aspects of the waste discharge requirements are summarized below (Appendix B):

- (1) "Liquid control barriers shall be provided to retain leachate from the leachate collection system to prevent any discharge to South Fork Eel River or its tributaries (sic)." The Regional Board anticipated that leachate, flowing in the drainageway through the center of the site, would be collected and stored in a pond constructed below the landfill area. Under the requirements' provisions, "discharge of treated leachate will be considered after satisfactory evidence is submitted by the discharger that pollution or nuisance conditions would not occur".

- (2) "Surface drainage from tributary areas, and internal site drainage from surface and subsurface sources shall be controlled to minimize percolation through Group 2 wastes discharged at the site." To the north and west of the landfill working area, a trench was constructed to intercept all surface drainage from off-site. At the bottom of the trench an 8 inch permeable steel pipe in a bed of gravel is to be located to intercept subsurface flow into the site. Since this trench will not intercept bedrock for its entire length (bedrock was 20 feet or more below the surface level in some areas), it is expected that groundwater will still seep into the landfill area. This subsurface interceptor is to be completed in the spring of 1974. Surface drainage from the high ground to the northwest flowed through the site in the drainageway. A corrugated steel pipe was installed in the drainageway to divert surface drainage through the site without being contaminated by any leachate.
- (3) The discharger shall submit a plan which details how the requirements will be met; specifically indicating, among other things:

- Method of leachate collection under the landfill.
- Leachate handling and disposal methods.

The central drainageway performs as a leachate collector. The quantity of leachate flow is so small that the County does not think it constitutes a hazard to the south fork of the Eel River.

- (4) "The discharger shall comply with the Monitoring Program No. 73-14 as specified by the (Regional Board's) Executive Officer." In compliance with the monitoring program, three monitoring wells have been installed "to detect possible southward movement of leachates from the initial landfill area". A 60° angle V-notch weir has been installed in the central drainageway to measure the quantity of leachate flow. An initial measurement in January 1974, indicated a flow of 0.0072 CFS. Extrapolation of the measurement for the month of January indicates a total flow of 19,284 cubic feet/month (0.0000036 of the approximate flow of the Eel River for the same period).

3.2.4 OPERATIONAL CHARACTERISTICS *

Since the site is not open to the general public, as specified in the purchase agreement, a full time gate attendant is not provided. The principle site users are (1) County collection vehicles, (2) franchised collectors, (3) collection vehicles operated by the State Park system, and (4) other special users (e.g., demolition contractors). There is no charge for use of the site. The project field personnel can perform both collection and disposal tasks, although the senior employee (leadman) generally has responsibility for the disposal operation. Frequently, the site is left unattended while the containers are being serviced. Authorized site users have a key to the gate and use the facility at their convenience (recording the weight of waste delivered for each visit). Others may make arrangements for using the site by calling the Department of Public Works and making an appointment. On such occasions, field personnel are in attendance to weigh the waste and supervise disposal.

A Caterpillar D-6 track type tractor with bulldozer blade is leased by the County and permanently maintained at the site for routine disposal duty. Other equipment is used occasionally at the site for special purposes on force account or under contract.

- Initial Difficulties. The site master plan called for a phased development, initiated by the construction of a trench near the middle of the site. From this trench, the landfill was to progress in a northerly direction (uphill) by excavating cover material from the north side of the trench. Without approval of this plan from the Regional Water Quality Control Board (RWQCB), the County was hesitant to proceed with the sizable, initial trench excavation. Expecting that the RWQCB would issue waste discharge requirements "any day", the County began an interim fill area (at grade) just to the south of where the initial trench should have been excavated. If the site plans were approved as submitted, the "interim fill" could conveniently be pushed into trench and the site development would proceed as planned. If the RWQCB required that the landfill operation be conducted some distance above the bedrock level (the major concern among the design team), the trench would not be excavated as deep as originally anticipated. The consequences of the latter course of action would have diminished the life of the site but not altered the basic site development concept.

* Described as experienced during the project and prior to closure of the site due to loss of the access road.

During the ensuing months, there was still no response from the RWQCB, and the "interim fill" area continued to be used. Due to the time consuming nature of the Garberville site (to be discussed in a later section), the project was understaffed with respect to field personnel. The manpower shortage, combined with normal start-up difficulties, placed pressure on the field personnel just to keep-up with their container collection duties. As the RWQCB continued to delay and the field personnel struggled to service the containers, the "interim fill" area grew larger and looked more and more like a permanent feature of the disposal site.

By the time the waste discharge requirements were finally issued on February 28, 1973, plans for final construction of the "initial" trench were abandoned and the second phase trench was excavated first. This trench was oriented parallel to the first proposed trench and to the south of it along the 200-foot setback from the bluff. The northern edge of this trench will be progressively excavated for cover material. The landfill will be developed in a northerly direction, until it reaches the southern face of the "interim fill" area.

- Refuse to Cover Ratio. The present operation is located in the southern trench excavation. As the trench was being utilized during the early spring of 1973, an effort was made to confirm the refuse-to-cover ratio anticipated in the master plan. The material excavated from the trench and used as cover was compared to the quantity of solid waste disposed of in the trench. The results of this evaluation showed that instead of a 3:1 refuse-to-cover material ratio, the operation was actually realizing a ratio closer to 1:1. The effects of this finding were far-reaching. Instead of a 23-year site life with a modest surplus of cover material, the life of the site was reduced to 7 to 8 years, with cover material being the limiting factor.

Reconsideration of this result, based on the disposal cell geometry, has showed that it is entirely plausible. As will be shown later, the average daily waste quantity received at the landfill is approximately 11 tons. In a 40-foot wide by 10-foot deep trench, with a 2:1 sloping working face and an in-site density of 1,000 pounds / cubic yard, the depth of compacted refuse on the working face is 7.9 inches. With a minimum daily cover requirement of 6 inches, the refuse-to-cover material ratio is approximately 1.3:1. Although conservation of cover material can be achieved by reducing the size of the working face, maneuverability requirements of the unloading collection vehicle and the landfill bulldozer impose practical limits on the minimum size of the working face. Over the long term, it is doubtful that operational procedures can be altered to produce a refuse-to-cover ratio much greater than 1.0-1.5 to 1.0.

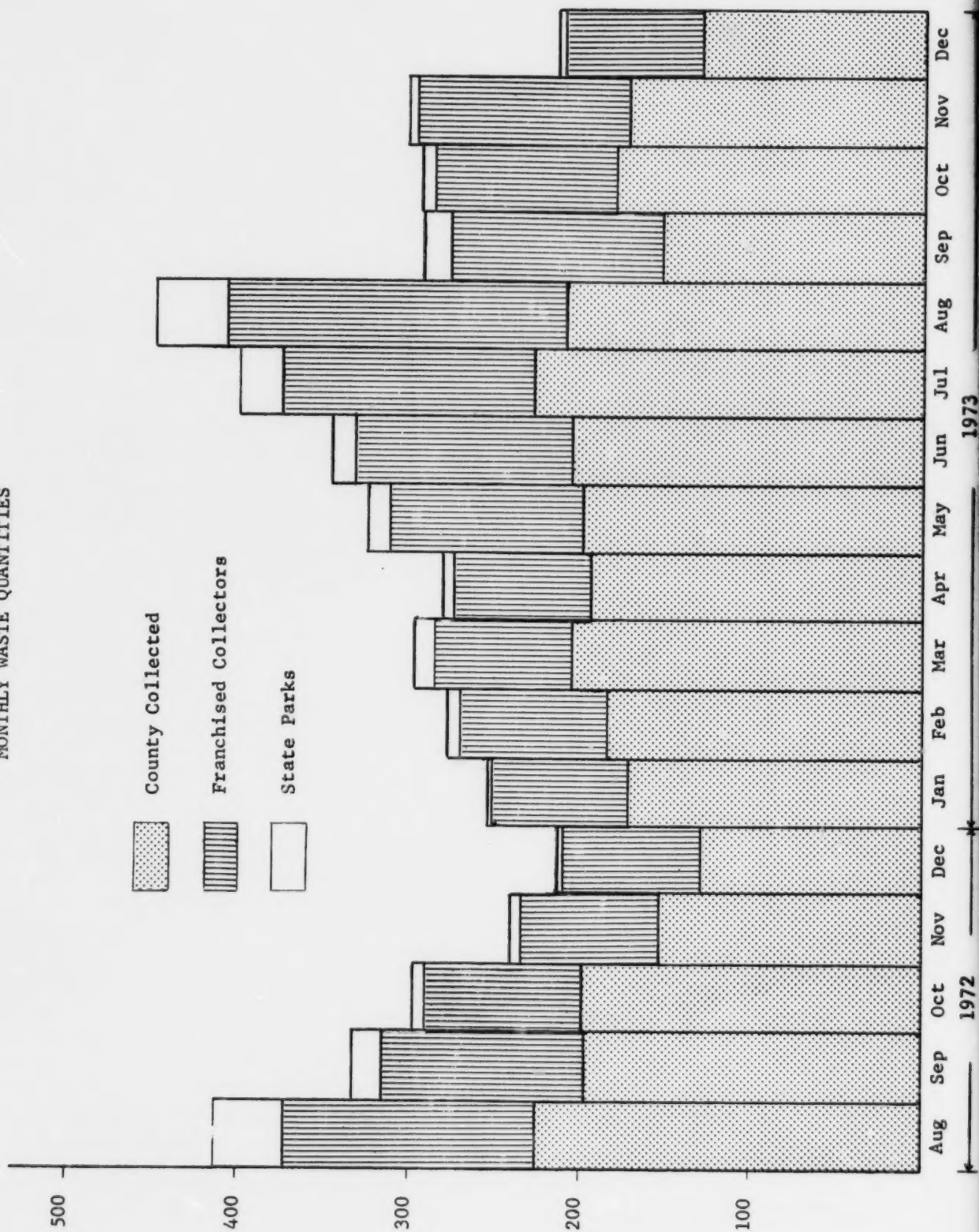
- Disposal Site Data. The monthly waste quantities received at the landfill demonstrate the typical seasonal variation in solid waste generation (Figure 3). December appears to be the low point, with waste quantities increasing by approximately 100 percent during the summer months. During the project operational period, the landfill received an average monthly waste quantity of 327 tons, or approximately 11 tons per day (Appendix C).

The cost categories associated with the landfill operation are: (1) equipment, (2) labor, (3) land, (4) initial site development, and (5) miscellaneous. The equipment consists of a Caterpillar D-6 track type tractor, leased at a rate of \$17.325 per hour with a 100-hour per month minimum. The labor cost is allocated to the landfill operation at a rate of \$7.50 per hour, which includes both wage and overhead. The land cost is \$75,000, amortized for seven years at an interest rate of six percent. The initial site development included scale installation, engineering, fencing, access road, on-site clean up, etc. This cost of \$54,000 is amortized for seven years at six percent per annum. One major miscellaneous cost consists of \$1,700 for construction of a surface interceptor trench on a contract basis. This expense is amortized on the same basis as the other capital investments. Based on an accounting of costs in this manner, the unit disposal cost for the 17-month demonstration period was \$14.55 per ton (Appendix C).

Two adjustments may be made to this unit cost with respect to the labor and equipment categories. To account for necessary non-productive paid time for such things as administration, educational activities, and idle time, the labor cost should be increased by 10.3 percent. Were the landfill equipment purchased at the beginning of the project, instead of leased, the cost might approximate \$12 per hour in use. Including these considerations, the adjusted disposal cost is \$12.26 per ton.

One other major capital expenditure should be noted, although it is not included in the data discussed above. In response to the RWQCB's waste discharge requirements, the County contracted for additional site work. This work included test wells for subsurface water quality monitoring, a corrugated metal culvert to divert off site drainage through the site, and a permeable material subsurface interceptor along the northwest boundary of the landfill working area. Although this work was initiated in the fall of 1973, it will not be completed until weather permits in the spring of 1974. The estimated cost of this work is \$25,000. Based on a useful life of six years, this construction may represent an additional \$1.30 per ton to the future disposal costs.

FIGURE 3 - BENBOW SANITARY LANDFILL
MONTHLY WASTE QUANTITIES



3.2.5 CLOSURE OF LANDFILL

As the project team began to deliberate the concepts to be employed in an expanded County-wide container program, the implications of the foreshortened life of the Benbow Landfill required evaluation. The landfill soon became to be regarded as an interim site, to be replaced by a transfer station when it reached capacity and/or when a new County-wide disposal facility was developed in the Eureka vicinity. The details of the County-wide solid waste program are discussed in a later section.

During January 1974, heavy rains caused extensive damage in Northern California, so that Humboldt County was declared a disaster area. One of the victims of these storms was the access road leading to the landfill site. Portions of the steep hillside holding the access road slipped into the south fork of the Eel River. An inspection of the hillside showed signs of continued instability that could result in further earthslides. Restoration of the access road would be difficult from a technical standpoint as well as extremely costly (preliminary estimates of \$300,000). Comments by the County's engineering geologists that "Northern California is on the move, literally" have proved to be entirely accurate.

At the present time the Benbow Landfill is inaccessible to vehicular traffic. For a brief period of time the container collection vehicles delivered waste to a landfill in the Eureka vicinity. The additional 100- to 130-mile round trip to the disposal site proved to be too time consuming to adequately service the container system in the Demonstration Project Area. Permission was secured from all appropriate regulatory bodies to reopen the Garberville dump site as an expedient short term solution to the disposal dilemma created by the emergency. The operation of the container collection system was not interrupted by the Benbow Landfill closure, and it continues to service the container sites, on schedule, utilizing the Garberville dump site for disposal.

The Garberville dump was being utilized as an interim solution to permit continuous service and evaluation of the containerized collection system. The dump site has been scheduled to close pending the construction of a facility to transfer the wastes to the proposed central landfill in the mid-County area. The implementation costs for expansion of the system, including the Garberville transfer station, has been previously budgeted by the County, and the County Board of Supervisors has instructed the Public Works Department to construct the proposed transfer station as soon as possible, to replace the current disposal operation.

3.2.6 SUMMARY OF DISPOSAL SITE DIFFICULTIES

The difficulties associated with the acquisition, development and operation of the Benbow Landfill have been considerable. To many this may not be a unique situation; it may be instructive, however, to recap these difficulties so that others may benefit from the breadth of experience gained during the project.

- (1) It took over a year and one-half to secure a land parcel for the disposal site, and then only after public appeals for help in the face of termination of federal financial support for the project. The site was finally judged to be the "best available" within the context of time limitations and numerous rejections from other owners of suitable property. Condemnation proceedings were considered but not employed because of lengthy time requirements necessary to complete the legal action.
- (2) Due to the type of land use adjacent to the access road for the "best available" site, the sale of the land to the County was contingent upon certain access restrictions. Site users would be limited to the County, the State Park System, Franchised Collectors, and certain other authorized users (e.g., construction and demolition contractors). Residents living in the vicinity of the Benbow Landfill would not be permitted to use the site. Instead, a crudely constructed container site, employing two 20-cubic-yard containers, was located at the old Garberville disposal site. As will be noted in a later section, servicing this high-volume and unanticipated container site diverted a great deal of available manpower from other project tasks.
- (3) Groundwater conditions at the Benbow Landfill site have caused continuing problems with respect to site development and leachate control. Subsurface permeable material drains will be completed in the spring of 1974 to reduce the groundwater flow into the landfill working area. Leachate is being generated by the site due to groundwater flow, as well as infiltration from the intense winter rains. A leachate monitoring program has been established to determine its quantity and quality. The effect of this leachate on the surrounding water quality has not been established, nor have practical methods for treating the leachate. The resolution of these problems may be only academic at this point, or they may necessitate further control measures.

- (4) The lack of responsiveness on the part of the Regional Water Quality Control Board contributed to substandard operational procedures during the initial period of the landfill operation. Had the differences in operational concepts between the County and RWQCB been resolved at an early date, site conditions probably could have been maintained at a much higher level throughout the life of the site.
- (5) Instead of the originally anticipated refuse-to-cover ratio of 3:1, the actual site operation realized a ratio of closer to 1:1. The net effect of this lower ratio may have been to reduce the life of the landfill to approximately one-third of the original site life.
- (6) Operating costs exceeding \$14.00 per ton have generated the need for a more economical alternative. The inherent inefficiencies of maintaining a low volume (less than 10 to 15 tons per day) disposal site outweigh the anticipated advantages of regional disposal sites. Expansion of the system will include the development of a single County-wide disposal site and transfer of all wastes from the Demonstration Project Area.
- (7) As a final blow to the viability of the Benbow Landfill, the access road washed out, leaving the site inaccessible to vehicular traffic. Restoration of the access road would cost approximately \$300,000.

CHAPTER 4: COLLECTION SYSTEM EVALUATION

4.1 DATA COLLECTION

A series of six forms are used to collect the necessary primary data for the project evaluation (Appendix D). A Trip Ticket (Form D-1) is completed each time that the collection vehicle services a container site or is used for some non-project activity. The data on each Trip Ticket is keypunched onto data processing cards for summarizing by a computer program developed by the U. S. Environmental Protection Agency, Office of Solid Waste Management Programs. Monthly summaries of this data are prepared quarterly (Appendix E-1 and E-2).

The other data collection forms relate to accounting for the landfill waste quantities, labor manhour distribution, landfill and collection equipment operation, and equipment repairs. From these forms, data is tabulated for the operation, maintenance, and repairs of each piece of equipment involved in the project. The County Accounting Division prepares equipment reports on a quarterly basis for all County equipment (Appendix E-3). This existing system has been employed to collect the data that relates to the Demonstration Project equipment.

From the six primary data collection forms, the Trip Ticket Summaries, and the Quarterly Equipment Reports, all the necessary data is available to quantify the quantities and costs associated with the two types of collection systems, as well as the landfill operation.

4.2 IMPLEMENTATION OF TESTING SEQUENCE

As noted earlier, the project plan called for locating 40-cubic-yard containers at three sites and 8-cubic-yard containers at the remaining three sites for an initial 12-month period. For the next six month period, the type of container at each site would be interchanged. Comparing the initial six month period operation with the last would provide the basis for determining the relative performance of the two types of systems subject to the same seasonal influences. During the course of the project it became necessary to alter the testing program (Table 3) in order to accommodate certain external constraints.

- (1) The initial test period was reduced to 11 months (August 1, 1972 to June 30, 1973) so that the change over of container types would coincide with the beginning of a calendar quarter, the time period employed in the quarterly equipment reports.

TABLE 3
CONTAINER SYSTEM TEST SEQUENCE CHARACTERISTICS

Container Site	August 1972 through June 1973	July 1973 through December 1973
Alderpoint	8 c y containers	40 c y container containers without lids containers level with dumping platforms
Blocksburg	8 c y containers	8 c y containers containers with lids containers level with dumping platform
Fruitland	8 c y containers (August to April)	40 c y container (May to December) containers with lids containers 30 in. above dumping platform
Petrolia	40 c y container	40 c y container containers with lids containers 30 in. above dumping platform
Shelter Cove	40 c y container	8 c y containers containers with lids containers level with dumping platform
Thorn	40 c y container	8 c y containers containers without lids containers level with dumping platform

- (2) At the Fruitland site, a 40-cubic-yard container was the principal type employed during May and June 1973. This situation represented a change in type of container two months prior to the anticipated change over date. During a portion of May, both types of containers were located at the site to determine the effect on site usage and performance. (As will be discussed later, it was thought that bulky wastes could be placed in the large container and "loose" waste in the small ones, thereby extending the time between servicing.) At the heavily used Fruitland site, the 40-cubic-yard system outperformed the 8-cubic-yard system so dramatically that the use of both container types was abandoned, and the 40-cubic-yard container was used exclusively.
- (3) When the types of containers were interchanged on June 30, 1973, there was no alteration at the Petrolia and Blocksburg sites. At the Petrolia site the 40-cubic-yard container was to be replaced with 8-cubic-yard containers. To service the 8-cubic-yard containers, the compaction body had to be mounted on the collection vehicle. As will be discussed in Section 4.9, the collection vehicle, loaded with the compaction body and waste from a site, frequently exceeded the highway weight limitation established by the State of California (48,000 lb). A bridge on the route to service the Petrolia site had a weight limitation (38,000 lb) that was less than the general gross vehicle weight (GVW) restriction. Prudence dictated that, even during a developmental project, the heavily weighted vehicle not test the structural integrity of the bridge. Consequently the 8-cubic-yard containers were not located at the Petrolia site. Blocksburg was not converted from an 8-cubic-yard site to a 40-cubic-yard site in response to the situation at Petrolia. If Petrolia remained a 40-cubic-yard site and Blocksburg were converted to one, four sites would require 40-cubic-yard containers. Since only five 40-cubic-yard containers were initially acquired, only one could be in transit at any time on the way to service a 40-cubic-yard site. Consequently, only one vehicle could service the 40-cubic-yard sites at any one time, in spite of the fact that there were two collection vehicles. In order to properly service all of the container sites, both vehicles were necessary. To maintain the overall adequacy of the container collection system, the Blocksburg site was not converted to a 40-cubic-yard container, so that there remained three 40-cubic-yard sites and three 8-cubic-yard sites.

4.3

TWENTY CUBIC YARD CONTAINER SITE

The 20-cubic-yard container site at Garberville was hastily developed to permit servicing of the Garberville area without violating the access restrictions placed on the Benbow Landfill; namely, prohibition of general public use of the site. The container site itself is simply a shallow excavation, lined with large logs on either side. The containers are slid into the excavation, and subsequent site users deposit waste into them from either side of the excavation. There is no grading, paving, or landscaping, although some of the access area has been graveled (Plate 11).

Although this container site was an ad hoc response to restrictive disposal site conditions, it has continued in operation for the duration of the demonstration project. The 20-cubic-yard containers were used because they had been acquired for just such unexpected developments. Were this site formally developed, one, or possibly two, 40-cubic-yard containers would be located here. The 20-cubic-yard containers are too small for the quantity of waste delivered to the site. The site requires two to three servicings per day during the peak summer months. During the entire project period, over 41 percent of the collection time was devoted to this site, and almost 25 percent of the entire project manpower requirement.

Because of the extra, unanticipated labor necessary to service the Garberville site, the total project was initially understaffed. During the crucial, early months of the project, the field personnel struggled to adequately service all container sites. Ten- to twelve-hour days for six to seven days per week were the rule rather than the exception at this time. Priority was placed on the container collection system to prevent the container sites from becoming dumps and jeopardizing community support. The manpower shortage contributed to the sub-standard operation at the Benbow Landfill.

Adequate manpower was finally secured; at first on a temporary basis, and finally on a permanent basis. However, some ramifications of the improper start at the landfill still linger on.

4.4

CONTAINER SITE RATING

On the Trip Ticket (Appendix D-1), the collection vehicle driver recorded the general conditions at each container site serviced. A subjective evaluation of three site condition categories is provided:

- Litter: Waste randomly scattered around the site.

- Spillage: Resulting from an attempt to place waste into the container. The spillage may be due to too large a load of loose waste for the size of the container opening; or it may be due to the container's being too full to receive additional waste; or simply poor aim.
- Vectors: Presence of rats, flies, yellow jackets, etc.

If the site experienced none of these conditions (or to a very slight degree), the vehicle driver recorded a "1" in the appropriate category. If the site experienced any of these conditions to a severe degree, the driver recorded a "3" in the appropriate category. Similarly, intermediate conditions are denoted by a "2".

Although the time required to clean up a site can be reduced to an economic value, it tends to relate closely to the non-economic factors. The higher the clean-up time, the greater the probability that the site has experienced litter, spillage, and vectors during the intervening time between collections.

The 17-month project period included the 5-month period from August to December in both 1972 and 1973. So that like seasonal conditions may be compared, these 5-month periods serve as the basis for the non-economic evaluation of the site conditions (Table 4). For each container site, the average site rating and clean-up time has been calculated for the two separate periods. The average values for the Blocksburg and Petrolia sites, where the container types were not interchanged, seem to indicate that site conditions were generally better in 1972, than in 1973. However, for the Alderpoint and Fruitland sites, where the 8-cubic-yard containers were replaced by the 40-cubic-yard containers, the average site ratings and clean-up time requirement showed decreases, indicating more attractive site conditions. At Shelter Cove and Thorn, where the 40-cubic-yard containers were replaced with 8-cubic-yard containers, the site condition indicators show a deterioration in 1973 when the 8-cubic-yard containers were employed. Acknowledging that the absolute value of the average site ratings have little significant meaning, the relative magnitudes lead to the consistent conclusion that the sites employing the 40-cubic-yard containers required less clean-up time and that visual and sanitary conditions are better than for the 8-cubic-yard containers. This result is consistent with the observations of the project team and is confirmed by interviews with site users, to be discussed in Section 4.12.

TABLE 4

CONTAINER SITE RATINGS AND CHARACTERISTICS*

Container Site	August to December Comparison Period	Container Size	Average Site Rating**		Average Clean-up Time (minutes)	Height of Container Above Dumping Level	Container Cover
			Litter	Spillage Vectors			
Alderpoint	1972	8 c y	2.53	2.61	14.2	same height	no lids
	1973	40 c y	1.63	1.54	12.1		
Blocksborg	1972	8 c y	1.04	1.04	6.3	same height	lids
	1973	8 c y	1.36	1.23	19.1		
Fruitland	1972	8 c y	1.98	1.94	12.2	30 in. higher	lids
	1973	40 c y	1.68	1.65	16.9		
Petrolia	1972	40 c y	1.07	1.07	6.9	30 in. higher	lids
	1973	40 c y	1.45	1.58	18.3		
Shelter Cove	1972	40 c y	1.00	1.00	5.4	same height	lids
	1973	8 c y	1.09	1.17	10.0		
Thorn	1972	40 c y	1.50	1.46	9.4	same height	no lids
	1973	8 c y	1.88	1.48	21.0		

* Source: Appendix F.

** Evaluation of site conditions by collection vehicle driver: 1 - good, 2 - fair, 3 - poor.

WATER POLLUTION

Observations by the project field personnel have shown that no measurable quantities of liquid or semi-solid waste are placed in the containers. Consequently, the only liquid effluent from the containers is a result of rainfall entering the container. During the six- to eight-month "wet season", the average rainfall is as much as 60 inches in certain areas of Humboldt County. For a 40-cubic-yard container, without a lid (22-foot by 8-foot top opening), approximately 106 gallons of rainfall would enter the container for each inch of rain.

To determine the quality of liquid effluent from containers under simulated field conditions, 200 gallons of potable water were poured into a full 8-cubic-yard container. After one week, a liquid sample was analyzed by the local Public Health Department. The results are shown below:

<u>Item</u>	<u>Influent</u>	<u>Effluent</u>
B.O.D.	-	2,061 mg / liter
Coliform (MPN)	-	over 24,000 / 100 ml
Ph	7.4	5.5
Settable Solids	0.0 ml / liter	0.4 ml / liter
Dissolved Oxygen	8.0 mg / liter	0.0 mg / liter

Large quantities of waste water with a composition similar to the test sample could pose a considerable threat to water quality.

When the lids on 40-cubic-yard containers are fully open, they form an angle from the horizontal of approximately 22 degrees. The horizontal projection of the open area, available for rainfall impingement, is approximately 11 square feet (versus 176 square feet for containers without lids). For one inch of rainfall, 6.6 gallons enter the container when the lid is open. Assuming the moisture content of the waste exposed to the rain increases from 50 percent to 60 percent, it is estimated that 3.2 gallons would be absorbed and 3.4 gallons would flow through as leachate. If the drain plug were removed from the container, this leachate would flow out onto the container site paving. Before the leachate would reach any soil it must flow across at least 50 feet of asphalt paving. If the leachate emerges while it is still raining, there would be ample opportunity for dilution and dispersion as it flows over the paving. The leachate produced in the container is considered to be an insignificant cause of water quality degradation due to its small quantity.

The container lids serve the useful purpose of shedding a large portion of the incident rainfall that would otherwise enter the container and generate leachate. This is true even if the lids are not closed after each use.

The potential for water pollution from 40-cubic-yard containers with lids is essentially nil, under present usage patterns. For containers without lids (both 8- and 40-cubic-yard), the potential quantity of leachate flowing from the container during wet weather is considerably greater than for containers with lids. Even with this greater leachate flow, it is doubtful that there would be any measurable degradation of surrounding water quality. Conservative practices, however, would suggest that container lids reduce the potential effect of leachate generation well below the level for concern.

Comparing the container collection sites to the previously operated open dumps, it is concluded that the container concept has been effective in virtually eliminating the water pollution associated with the dumps. Pollution could be entirely eliminated if the plugs were used in the bottom of the containers and all liquid was hauled to the landfill.

4.6 AIR POLLUTION

The container collection systems have permitted the closure of unsupervised dumps in the Demonstration Project Area. The County has been directly responsible for the closure of six open dumps where periodic burning was previously practiced. This effort has eliminated the open burning of 5,562 tons of solid waste, and resulting air pollution, during the project period. The basic container collection concept implies the elimination of open burning at disposal sites.

4.7 FIRE HAZARDS

The containers have experienced fires due to both accidents and vandalism at the unattended sites. Without continual site supervision it is virtually impossible to be assured that container fires can be eliminated. Since the fires have not structurally damaged the containers and rendered them inoperable, the most significant implication of these infrequent occurrences is the fire hazard they pose to the surrounding forests.

The California Division of Forestry requires that a 150-foot wide zone be cleared of combustible material and vegetation around dump sites. Since the Demonstration Project is an innovative alternative to open dumps, the Division of Forestry has been cooperative in applying the regulation until the full implications of the container system are known. Where containers are fitted with lids, the full 150-foot clearance may not be required because of the tendency of the lid to confine the burning material to the container.

Future experience may show that more positive measures must be taken to control container fires. A conceptual design of a fire suppression method centers around a double lid for the 40-cubic-yard container. The inner lid is attached to the regular, steel outer lid by fusible links and gas pre-charged tubing. During a container fire, the inner lid is released and falls closed, effectively confining the burning material to the container. In any fire suppression method, it is important that the technique be simple, reliable, and not encourage additional vandalism.

During the project period, the level of fire hazard from container fires was not severe enough to warrant additional developmental work on fire suppression techniques. The incidence of container fires has presented such a dramatically reduced forest fire hazard, compared to the open burning at the old dumps, that the project team and Division of Forestry feel that no additional fire control measures are required at this time.

4.8 SOLID WASTE CHARACTERISTICS

4.8.1 WASTE DENSITY

For each service trip to a container site, the collection vehicle driver records on the Trip Ticket the volume of waste in the containers estimated to the nearest quarter container volume. The weight of waste is recorded when the collection vehicle returns to the landfill. Using these values, the container waste density has been calculated on a monthly basis (Appendix F). These densities show considerable seasonal variation: 100 percent or more increase from the dry summer months to the wet winter months. Due to the heavy rainfall (50 to 60 inches during the 6- to 8-month "rainy" season), these wide variations are not surprising. During the entire project, the average waste density in the 40-cubic-yard containers was 184 pounds / cubic yard; compared to 170 pounds / cubic yard for the 8-cubic-yard containers. For 13 of the 17 months in the project period, the 40-cubic-yard containers demonstrated a higher waste density (Appendix F).

The slightly higher waste densities in the larger containers may be due to their greater ability to accept elongated items. Such things as long pieces of lumber tend to fall crosswise in the 8-cubic-yard container and block out container space below them for other waste material. In the 22-foot long, 40-cubic-yard container, the same lumber would lie flat. Consequently, the larger containers seem to have a greater effective waste capacity, even though they have the same nominal capacity as five 8-cubic-yard containers.

4.8.2 WASTE GENERATION RATE

The total population for the Demonstration Project Area is estimated to be approximately 10,000. Based upon the 3,820 tons of solid waste received at the Benbow Landfill during 1972, the average waste disposal rate is approximately 2.1 pounds/person/day. Although waste quantity estimates were developed prior to installation of the container sites, the approximate nature of those estimates does not permit any meaningful comparison to waste quantity generation rates experienced after operation of the container sites. Based on general observations of the project staff, however, it appears that there has been no significant changes in the quantity and type of waste generated within the project area.

4.8.3 WASTE TYPES

It does not appear that the site users are selective in what types of solid waste they bring to the containers. The sites have experienced a broad range, including food wastes, gardening trimmings, white goods, dead animals, light construction debris, furniture, packaging, and even a Volkswagen automobile body. It appears there is essentially no difference between the wastes previously delivered to the open dumps and the wastes currently brought to the container sites.

Most of these waste items can be accommodated by either the 8-cubic-yard or 40-cubic-yard containers. The most notable exception has been some bulky, oversized waste items that will not fit into the 8-cubic-yard containers. On such occasions, the bulky item remains at the site until a crew from the County Road Maintenance Division can pick up the item and deliver it to the landfill. During the early stages of the project, this type of effort had been necessary on the average of approximately once per month. During the latter part of the project there has been very little problem in this regard.

4.9 MAXIMUM LEGAL PAYLOAD

With the compaction body mounted on the collection vehicle, more than one container site can be serviced in a single trip from the landfill. In Humboldt County, where the one-way travel times from the landfill to the container sites vary between 30 minutes and over two hours, this offers the potential of considerable savings. However, with the vehicle set up to service the 8-cubic-yard containers, the maximum legal payload is only 6.1 tons (based on the State of California limit for gross vehicle weight of 48,000 pounds). Consequently, the compactor payload is limited in many cases by weight restrictions rather than volumetric capacity. The capability

of servicing all three 8-cubic-yard container sites in one trip is severely restricted. Even servicing two of these sites in a single trip is limited to some degree by the legal weight limitation. During the first 12 months of system operation, there were 178 service trips to the 8-cubic-yard container sites. For 14 percent of these trips, the loaded vehicle exceeded the weight limitation.

With the compaction body dismounted, the collection vehicle can legally carry a payload of nine tons confined in a 40-cubic-yard container. In this configuration, it can service only one container site per trip. Even with the increased legal payload capability, the collection vehicle exceeded the weight limit for 1.6 percent of the 308 trips to the 40-cubic-yard container sites.

These trade-offs between the two systems are reflected in the collection costs, and will be discussed in Section 4.11.

4.10 COLLECTION VEHICLE OPERATING COST

So that the cost of operating the collection vehicles may be allocated to the various types of collection activity, it has been reduced to a unit cost (\$/mile). Since the equipment report is prepared by the County Accounting Division on a quarterly basis, the unit vehicle costs have been calculated for like periods. During the project the quarterly vehicle costs varied from slightly over \$0.15 per mile to almost \$0.64 per mile, with a project average of \$0.335 per mile (excluding driver cost and equipment depreciation) (Appendix G).

More than half of the collection vehicle cost was due to necessary repairs to the equipment. Although heavy duty equipment was specified for the vehicles in anticipation of the severe driving conditions in the County, they have been put through a great deal of punishment in meeting the collection schedules. Front wheel assemblies, brakes, bearings, transmissions, etc., have required repairs. The project staff has concluded that excessive waste loads (Section 4.9) are significant contributors to these high repair costs.

The second highest cost category is tires, accounting for over 25 percent of the total cost. The major difficulty has been due to cuts and punctures on rural roads and at the landfill. The present practice of using cold cap tires, with a harder tread, has reduced damage from sharp objects; however, this process is more costly. During the entire operating period, tire life has averaged 16,500 miles.

During the present period of "energy crisis" and fuel allocation, it is interesting to note that the cost of fuel has accounted for only 9.6 percent of the vehicle operating cost.

The total vehicle cost, including operation, maintenance, vehicle depreciation, and driver, was approximately \$0.82 per mile for the first 17 months of system operation (\$0.335 / mile, operation and maintenance - Appendix G; \$0.193/mile, depreciation - Table 5; and \$0.289/mile, vehicle driver).

4.11

CONTAINER COLLECTION SYSTEM OPERATING DATA

The unit collection cost for the 40-cubic-yard system was \$42.47 per ton, compared to \$44.68 per ton for the 8-cubic-yard system, during the project period (Table 5).

The capital cost amortization for the collection vehicles is reduced to a per mile cost by assuming an annual vehicle mileage of 25,000 and a useful life of 175,000 miles, or seven years. The per mile amortization is \$0.193 per mile. By using this method, the more rapid depreciation associated with the much higher mileage requirement of the 40-cubic-yard system is calculated to be almost twice as much as for the 8-cubic-yard system. This cost distribution is not strictly true because of the much higher vehicle weights associated with the 8-cubic-yard system. The compaction body and excessive waste payloads should create a higher depreciation rate than for the much lighter vehicle weights associated with the 40-cubic-yard system. Because of the difficulty in quantifying this difference, the same depreciation rate is applied to the vehicles serving both systems.

As noted earlier, more than half of the collection vehicles' operating cost is due to repairs. The project staff feels that some of this repair cost is attributable directly to the exceedingly high vehicle weights associated with the 8-cubic-yard system. The unit collection costs do not reflect this sentiment because of difficulties in quantifying it: both vehicles are used interchangeably in servicing the two types of container sites. Consequently, the same operating cost per mile is applied to both types of systems.

The majority of the variable cost associated with the compaction body is due to required repairs. On two occasions, the front loading lifting arms have failed under the stress of a heavily loaded 8-cubic-yard container. The failure was due to insufficient cross sectional steel in the arms themselves, and there was no damage to the lifting mechanism. Additional steel, welded to the outside of the lifting arms, seems to have satisfactorily remedied the problem.

One further note is necessary with respect to the relative collection costs of the two container systems. Since 50 to 55 percent of the total collection cost, for both systems, is capital cost

TABLE 5

COLLECTION SYSTEMS OPERATIONAL AND COST DATA

(AUGUST 1972 TO DECEMBER 1973)

	Collection System	
	8 Cubic Yard	40 Cubic Yard
Weight collected (tons)	682.6	856.6
Vehicle mileage	11,860	22,575
Labor (manhours)	804.4	1,064.1
Capital cost amortization		
Container sites ⁽¹⁾	\$ 10,047	\$ 10,865
Collection vehicles ⁽²⁾	2,289	4,357
Compaction body ⁽³⁾	2,686	3,145
Containers ⁽⁴⁾	2,057	-
Subtotal	\$ 17,079	\$ 18,367
Variable cost		
Container site maintenance	200	-
Collection vehicle		
Operation and maintenance ⁽⁵⁾	4,308	8,884
Compaction body maintenance	2,409	-
Container maintenance	476	1,042
Labor ⁽⁶⁾	6,029	8,083
Subtotal	\$ 13,423	\$ 18,009
Total cost	\$ 30,502	\$ 36,376
Unit collection cost (\$ / ton)	\$ 44.68	\$ 42.47
Adjusted unit collection cost (\$ / ton) ⁽⁷⁾	\$ 47.24	\$ 45.19

- (1) Amortization of three sites at \$28,200 each, for each system (six percent for twenty years). For two months, forty-cubic-yard containers were at four sites and eight-cubic-yard containers at two sites.
- (2) Amortization of \$29,595, less ten percent salvage value (six percent for seven years). At 25,000 miles per year, unit cost is \$0.193 per mile.
- (3) Amortization of \$12,935, less ten percent salvage value (six percent for eight years).
- (4) Amortization of twenty eight-cubic-yard containers at \$8,925, and five forty-cubic-yard containers at \$13,640 (six percent for eight years).
- (5) \$0.335 per mile (Appendix G).
- (6) \$7.50 per manhour; includes wage and overhead.
- (7) Labor cost increased by 28.9 percent to reflect non-productive paid time.

amortization, the unit collection costs are especially sensitive to the quantity of waste collected. During the first ten months of operation, the quantity of waste collected was approximately the same for both systems: 444.1 tons for the 8-cubic-yard system (Appendix H) and 448.0 tons for the 40-cubic-yard system (Appendix I). The corresponding unit costs for the 8- and 40-cubic-yard systems were \$39.73 / ton and \$42.92 / ton, respectively. During each month after this time, the 40-cubic-yard system appears increasingly attractive from a unit cost viewpoint, as the quantity of waste collected continues to exceed the waste quantities associated with the 8-cubic-yard system. Although the unit cost for the 40-cubic-yard system was less than for the 8-cubic-yard system for the entire project period, it is clear that cost is only a partial measure of performance.

4.12

SITE USER FIELD SURVEYS

On three occasions during the course of the project, field survey teams were located at the rural disposal sites / container sites to interview persons using the facility. The first survey, in April 1971, was used to gain basic data regarding the use of the open dumps. The second survey, in April 1973, was conducted eight months after the container sites were developed so that the results could be compared to the earlier survey. The third survey, in October 1973, was conducted three months after the type of containers at the sites were interchanged. From these three surveys it has become apparent that the general site usage characteristics have not essentially changed over the past several years. The heaviest site usage is at mid-day, 11:00 am to 1:00 pm. The average unloading time is five to ten minutes and approximately two-thirds of the site users arrive in a pick-up truck. The predominate vehicle driver is a male, aged 16 to 35 years, and he is accompanied by one passenger. The site user drives five to six miles and ten to 15 minutes to the site, about four times per month (Appendix J). Approximately one-third of the site users dispose of some of their waste in some other manner than at the container site (animal feeding, burning, composting, franchise collector, etc.).

During the second survey, after the container system was instituted, 84.4 percent of those responding preferred the container system to the previously used open dumps. During much of this survey period, the Fruitland site containers were overflowing due to a failure in the compaction body, that prevented the proper servicing of the 8-cubic-yard containers at this site. If the Fruitland site responses are omitted, 90.8 percent of the respondents preferred the container system to the dumps. For those who preferred the open dumps, the major reasons were (1) high cost of the container system; (2) inability to place bulky wastes in containers, and (3) need for more frequent collection.

During this survey, the site users were asked, "What would you change about the way the container sites are set up?" Responses fell into the following categories:

nothing	48.3 %
larger containers	6.8 %
more containers	2.7 %
more or larger containers	1.4 %
empty containers more frequently	13.6 %
go back to the dump	3.4 %
recycle more	4.8 %
other	19.0 %
	100.0 %

During the third survey, after the type of container had been interchanged, site users were asked which type of disposal system they preferred. The results are shown below:

Preferred Disposal Method	Fruit- land	Thorn	Alder- point	Shelter Cove
Small containers (8 c y)	-0-	41%	-0-	20%
Large container (40 c y)	67%	10%	96%	40%
Old dump	11%	22%	4%	-0-
Other, don't know, no answer	22%	27%	-0-	40%

The results from Petrolia and Blocksburg are not tabulated because of the very low site usage during the survey period and because the type of container was not changed at these sites.

At Fruitland and Alderpoint, where the 8-cubic-yard containers were replaced by a 40-cubic-yard container, the vast majority of site users preferred the large container, and none preferred the small containers. Although more site users preferred the large containers to the small at Shelter Cove, the results are less conclusive. The site users at Thorn bucked the trend and preferred the 8-cubic-yard containers. One reason for this difference may be due to the nature of the site users. In the Thorn area, numerous young people (many from urban areas) have established alternative life styles. These life styles emphasize frugality, conservation, and minimum consumption of natural resources. During the second site survey, the Thorn site users indicated a strong preference for maximum recycling of solid waste products. Some site users indicated that recycling could be facilitated by using 8-cubic-yard containers to collect several recyclable fractions of the waste stream. A container would be used exclusively for such components as glass, paper, aluminum, steel cans, etc. With the 40-cubic-yard container, all the valuable products get "mixed-up" and recycling is more difficult.

Taken on the whole, it appears that the site users prefer the 40-cubic-yard containers to the 8-cubic-yard containers. They prefer the container concept to the old, open dumps. Many of the site users feel that operational improvements should be made to prevent container overflows due to too infrequent collection.

4.13 VANDALISM

The container sites are located in relatively isolated areas; they are unattended; and access is not restricted in any manner. These characteristics make the container sites prime candidates for vandalism. To a greater or lesser degree, each site has experienced vandalism. These incidents include breaking glass on the paved area, painting obscenities on the containers, setting fires in the containers, etc. The most damaging type of vandalism has been the setting of fires. Even in the case of fires, however, the vandalism has been more disruptive than permanently damaging. The containers remain functional after the fire, and usually require only repainting. It is fortunate that the container site design is basically "vandal-proof", that is, the container sites have remained functional after incidents of vandalism. Although such incidents have occurred, the number and degree have not been unusual or excessive for such remote, unattended facilities.

The cost of vandalism to the County is reflected usually in site clean-up time and container maintenance. The cost of the container collection systems discussed in Section 4.11 included costs associated with vandalism.

4.14 COMBINED CONTAINER SYSTEM

As the project was originally conceived, it was thought that a combination of 8-cubic-yard and 40-cubic-yard containers at a site may provide advantages in economically dealing with bulky wastes. For example, the 40-cubic-yard container could be used exclusively for bulky wastes and the 8-cubic-yard container for other "compactible" wastes. The 8-cubic-yard containers would be emptied approximately weekly and the 40-cubic-yard container approximately monthly.

The economic advantage of such a combined system depends heavily upon the willingness of site users to place their waste in the appropriate containers. Enforcement of such a requirement to separate waste types would be virtually impossible without expensive full-time supervision. Additionally, initial observations did not confirm significant quantities of problem bulky wastes. In short, the project team had doubts as to the need and potential for success of a combined container system.

During the initial operational period, the 40-cubic-yard container system was considered superior to the 8-cubic-yard system. At that time, the major reason for this tentative evaluation was a series of breakdowns in the compaction body. With the costs for the two systems approximately equivalent, the operational reliability of the 40-cubic-yard system proved to be the determining consideration. The feasibility of the combined system was further diminished by these conclusions regarding the superior operational characteristics of the 40-cubic-yard system.

The project team finally concluded that the extensive efforts necessary to implement the combined system were not warranted in light of the limited potential for success. The 40-cubic-yard container system proved to be effective, and the combined system appeared to offer little possibility for improvement in performance.

4.15

COLLECTION FREQUENCY

Based on health and sanitation considerations, weekly removal of solid waste from residences is generally recommended. This minimum collection frequency has been applied to the container collection system, especially during the summer when vector problems are most severe. (See Section 4.16.) Rationalizing an optimum collection frequency, above the minimum, is an extremely difficult task. Basically, the containers should be picked up when they are full, and not before. Predicting when a container will be full depends upon several things, including, season, holidays, weather, etc. As a practical matter, the collection schedule evolved during the course of the project as the field personnel gained experience with the peculiar characteristics of each container site.

Similar to the waste quantity seasonal variations, the collection frequency has shown an approximately 100 percent increase from the slow winter months to the peak summer months (Table 6).

The most difficult problem in establishing an appropriate collection schedule is to deal with the non-regular daily peak loads. For example, a single resident involved in a major clean-up on his property may cause the container site to reach capacity considerably before its historically appropriate collection time. It is virtually impossible to anticipate such peak loads. If the container sites were monitored on a daily basis, collection schedules could be adjusted to accommodate peak loads. Consideration has been given to assigning a roving crew the job of monitoring site conditions. Their task would be to visit each site for maintenance, clean-up, and emergencies that may develop. Additionally, they would notify the collection personnel of any unusual waste loads

TABLE 6
CONTAINER SITE COLLECTION FREQUENCY

	Services Per Month						Total
	Petrolia	Shelter Cove*	Thorn	Blocksburg	Fruitland	Alderpoint	
August, 1972	8	5	12	9	13	9	56
September	7	4	12	7	13	9	52
October	5	3	11	5	11	9	44
November	5	1	8	4	8	8	34
December	3	1	5	4	7	5	25
January, 1973	4	1	6	6	8	6	31
February	3	1	4	4	5	4	21
March	4	2	6	4	5	4	25
April	4	1	7	3	6	6	27
May	5	5	7	2	9	7	35
June	7	4	8	6	9	9	43
July, 1973	8	5	12	4	11	8	48
August	7	4	13	5	8	7	44
September	9	4	11	4	8	8	44
October	8	6	10	5	9	9	48
November	4	5	8	4	8	6	35
December	5	4	6	4	7	4	30

* Only one or two permanent residents during winter months.

so that collection schedules may be adjusted accordingly. In this manner the collection system can be made responsive to the widely varying waste generation rates that have been encountered in the project.

4.16

VECTORS

As part of the Demonstration Project, the Vector Control Section of the California Department of Health provided an analysis and evaluation of vector problems associated with the program. The following summary of their activities has been provided the County by Earl W. Mortenson, Regional Supervisor of the Vector Control Section:

"As part of our cooperative effort in the Humboldt Container Demonstration Study, a series of observations were conducted by Dr. George Rotramel, Mr. Earl W. Mortenson and Mr. Jerry Prine on vector problems associated with the former open land disposal sites prior to the inauguration of the container operation. A second phase of this effort was to evaluate any possible vector problems that would develop in the container operation and compare the vector potential of the old open disposal site method with the conversion to the container operation.

"Open Disposal Site Evaluation. Vector observations were made during October 1969 and 1970 of the Petrolia, Thorn, Alderpoint, Fruitland and Garberville disposal sites. Counts were made of domestic adult flies on the five sites with the aid of the Scudder Fly Grill during October 1970. The counts on all sites averaged 13.0 flies per grill count, (a count of 10 or above is indicative of a heavy fly infestation). The predominate species present was Phaenicia sericata, the common green blow fly. Evidence of rat infestations (active burrows and droppings) were present on Petrolia, Alderpoint, Fruitland and Garberville sites. Trapping these sites for trap night indices was not considered feasible because of the persistent uncontrolled burning and frequent dumping of refuse over most of the site. Sightings of yellowjackets (Vespula spp.) for both 1969 and 1970 were estimated as heavy for Thorn and Fruitland, with the other three sites having light to moderate numbers of wasps. Sweep net collections across the face of the Fruitland site averaged 50 yellowjackets per sweep. There was evidence of heavy foraging of raccoons on the Thorn site in October 1969.

"Vector Observations of the Container Operation. Observations were made in October 1972, March 1973 and May 1973 of the container sites at Petrolia, Thorn, Alderpoint, Fruitland and Garberville. The following is a summary of these observations.

"Petrolia Container Site. Less than ten flies were observed attracted to the 40 yard container. The fly counting grill cannot be used effectively in evaluating adult fly population when the counts are this low. Consequently, visual counts were made on the entire surface of each container. Less than five yellowjackets were observed during the October 1972 observation. After the container at Petrolia was in operation, we did not observe rodent activity in 1972 or 1973. A potential rat harborage did exist in sections of the old dump site left uncovered.

"Thorn Container Site. The adult fly count for the container surface was less than 10 Phaenicia spp. Fifty fly larvae and pupae were collected at the base of the loading ramp and were identified as Phaenicia sericata. The occurrence of these immature forms was the result of the 4th stage larvae migrating from an opening in the lower portion of the end gate of the container and seeking an area to pupate at the junction of the ramp wall and foundation pad. Yellowjacket sightings were less than 5 per observation period. There was no evidence of rodent activity at the container area. Observations made by Mr. William Strickland, of the Humboldt County Health Department, in May 1973 indicated that a black widow spider infestation was occurring in the drain pipes at the base of the loading ramp wall. The old Thorn site was leveled, covered and did not present any vector problems.

"Alderpoint Container Site. The October 1972 observations on this location yielded 15 flies per container. Organic residue was present in the bottoms of two 8 yard containers. There was no rodent or yellowjacket activity observed at this site.

"Fruitland Container Site. A collection of 300 larvae and pupae of the species Phaenicia sericata was taken at the base of the loading ramp wall, apparently these flies migrated as mature larvae from the containers. Less than 10 adult flies were observed in all the containers. There was an accumulation of sludge in two of the containers with a few

fly pupae cases in the material. In March 1973 debris on the front edge of the loading pad contained pupae of the black blow fly, Phomia spp. Rodent signs were not observed in 1972 or 1973.

"Garberville Container Site. The only problem at this site was a minor infestation of fly larvae in an accumulation of organic debris occurring in the space between the two 20 cubic yard containers.

"General Conclusions. In comparing the observations on the presence of flies, yellowjackets and rodents on the old style disposal sites to that of the containers system, it is obvious that major improvements have been made in reducing vector problems to insignificant levels. The key control factor in the container system is the frequent removal of refuse (up to three times per week for some sites in the summer and not less than once a week for any one site).

"The larger 40 yard containers appear to have less sludge accumulation, odors, adult fly and yellow-jacket activity than did the 8 yard units. The containers with solid lids appeared to be less attractive to yellowjackets than those with either wire mesh or no lids. Evidence of rodent infestations was negative for all container sites regardless of number or size.

"Attention to frequent maintenance of each site will be an important factor in preventing accumulations of spoiled refuse and container residue that could result in increased vector production or attraction.

"In the future, consideration should be given to monitoring the yellowjacket population and the degree of fly larval migration at each container location. If the yellowjacket population reaches a threshold level of human annoyance, a control program of toxic area baiting may have to be instituted. The fly larval migration rate from the containers should be evaluated periodically during the warm season. A certain portion of the garbage coming to the containers is already infested with fly larvae and will complete their life cycle at the site if the material is allowed to remain for a period of

time in the container. If the larval migration rate increases significantly, the containers will need more frequent cleaning and removal."

4.17 EFFECT OF CONTAINER LIDS

The effect of the container lids on system performance and operational characteristics is very much dependent upon whether site users close the lid after use (Plate 12). Conclusions drawn with respect to lid use are based on general observations made by collection vehicle drivers, by students during the field surveys, and by project staff during miscellaneous site visits. Simply stated, the lids are sometimes closed and sometimes left open after use. There is no available data with respect to the portion of the time that the lids are closed by a significant percentage of container users.

If the lids were closed after each site use, they would have a positive effect with respect to fire, rain, vectors, and litter. Closed lids would confine any burning material to the container and virtually eliminate the fire hazard to the forests surrounding the container sites. Closed lids would prevent rainfall infiltration and eliminate the potential for leachate generation. Closed lids would effectively confine the waste to the container and reduce the potential for site litter even during the most windy conditions.

If the lids are not closed, these positive benefits are still experienced, but to a lesser degree. With the lid open, burning material may escape from the container and pose a fire hazard to the surrounding area. However, the lid offers a positive fire control method when someone is present at the site. A random site user may be able to close the lid during a container fire. The California Division of Forestry has shown a willingness to relax the requirement for a 150-foot vegetation clearance surrounding the sites where the containers are fitted with lids.

As discussed in Section 4.5, the container lids shed rainfall, even when open, and may reduce rainfall infiltration by 90 percent.

An evaluation of the litter conditions at the container sites is shown in Section 4.4. To determine the effect of lids on litter, the Alderpoint site may be compared to the Blocksburg site for the August to December 1972 period. The litter

rating at Alderpoint, where there were no lids, is much higher than for Blocksburg, with lids (2.53 versus 1.04), indicating a higher incidence of litter at Alderpoint (Table 2). Comparison of the litter ratings for the Shelter Cove and Thorn sites (1.00 versus 1.50 in 1972 and 1.09 versus 1.88 in 1973) leads to the same conclusion that less litter is associated with the sites where containers are fitted with lids.

The concept of the site ratings was developed so that an evaluation of the container lids (among other things) might be facilitated. In retrospect, it is apparent that firm conclusions may not be based exclusively on this type of data. There are too many other variables that cannot be accounted for and that may distort the results, such as community pride in the site, waste quantities, wind conditions, etc. It seems reasonable to think, however, that container lids suppress the amount of litter at the sites, and the data does not conflict with this conclusion (Table 2).

Although only a portion of the site users make the effort to close the container lids, the lids appear justified by having a positive effect on fire, leachate, and litter control.

4.18

EFFECT OF CONTAINER SITE WALL HEIGHT

As noted earlier, two site configurations were incorporated into the demonstration project. At Fruitland and Petrolia, the retaining wall height was such that the top of the container was 30 inches higher than the level of the dumping platform. At the other sites the top of the container was level with the dumping platform.

By making comparisons similar to those in the previous section, the effect of the wall height on site conditions may be evaluated. By comparing the site evaluative data for Blocksburg and Fruitland for the August to December 1972 period, it appears that having the container top level with the dumping platform is associated with better site conditions (Table 2). Similar comparisons between the data for Petrolia and Shelter Cove lead to the same conclusion. As in Section 4.17, caution must be exercised in using these type comparisons to lead to firm conclusions. Other conditions should be taken into account.

During the initial operational period, there were numerous complaints from site users who drove pickup trucks that they could not lower the truck tailgate into the containers and conveniently push or sweep the waste directly into the container. At Fruitland and Petrolia, they complained that the top of the container was

too high above the dumping platform level. From this response, it was concluded that the container top should be approximately 18 inches above the dumping level; low enough to permit direct unloading from a loaded pickup truck.

One of the major cost categories in building the container site was the reinforced concrete retaining wall. Although the cost can be reduced by lowering the wall height, the lower the wall, the effect is to increase the elevation difference between the container and the platform. Combining this cost consideration with the conclusion in the preceding paragraph, it would seem that the optimum condition would be to have the container extend approximately 18 inches above the dumping level.

Container elevations less than this would needlessly raise the container site construction cost, as well as require the site user to stoop over further to open and close the container lid. Container heights greater than 18 inches would inhibit the convenient unloading of pickup trucks.

4.19

ALTERNATE COLLECTION VEHICLE USES

When a 40-cubic-yard container, without lids, is mounted on the collection vehicle, the unit may effectively function as a dump truck. On several occasions the vehicle has been used to haul limited amounts of gravel to maintain the disposal site access road.

As will be shown in Section 5.0, the 40-cubic-yard containers will be employed exclusively in the County-wide container system. At that time the compaction body and 8-cubic-yard containers will become surplus equipment for the rural collection system. Consideration is being given to locating the 8-cubic-yard containers at several of the County parks for use during the tourist season. The compaction body would be used to service these containers scattered throughout the County parks.

During the peak solid waste generation periods there is very little spare time when collection vehicles could be diverted to alternate County uses. The vehicles are fully utilized for their normal solid waste function. During the winter months, construction work is essentially halted because of wet weather. It is this general type of activity where the hauling capabilities of the vehicle and 40-cubic-yard container would seem to be useful. Equipment availability does not coincide with equipment need.

It appears that the solid waste collection equipment will be used almost exclusively for the designated function, with the infrequent exception of construction material hauling.

4.20

TRUCK MOUNTED CONTAINER WASH SYSTEM

The wash water system, including a 200-gallon tank mounted on the compaction body, cost \$300 (Table 1). A dilute solution of disinfectant / deodorant is put in the tank for washing out the 8-cubic-yard containers when they are serviced. This mobile wash system was necessary since the 8-cubic-yard containers are emptied at the site and are not returned to the landfill after each servicing, as is the case for the 40-cubic-yard containers.

The collection vehicle operators have found that containers do not need washing after each service. Generally the solid waste falls cleanly out of the container, leaving little or no residue. When a noticeable residue does develop in the container, the wash tank is used to rinse it out. The wash system has proved satisfactory in maintaining the containers at an acceptable sanitation and aesthetic level.

4.21

SOLID WASTE SEMINARS

As part of the Demonstration Project, several short seminars were to be held by Humboldt County in order to disseminate information developed during the program.

A seminar was held in Eureka on November 29 to 30, 1972, to present information relating not only to the Humboldt Project, but to rural solid waste systems in two other Pacific Northwest Counties as well. Over 130 people from eight western states attended the lecture series on November 29. The following day 110 people participated in a field trip to two container sites and the Benbow Landfill. The high attendance and interest expressed by the seminar participants confirmed the need for creative dialogue relating to rural solid waste management.

During the past several years, it has become apparent that solid waste management has "come of age" in California as a topic worthy of considerable study. As the Humboldt Project moved to its conclusion, the project team began to consider the format and date for a second solid waste seminar. Much to our surprise, it was discovered that four major solid waste conferences were scheduled for the fall of 1973 and spring of 1974 in California, as well as several smaller conferences. The proposed Humboldt County conference would have to compete with these others for both speakers and attendance. In light of this

situation, the proposed seminar was canceled and the final results of the Demonstration Project were presented in a paper given at the Sixth Annual Western Regional Solid Waste Symposium on March 7, 1974. This "competing" conference was co-sponsored by the City of Santa Clara and the Governmental Refuse Collection and Disposal Association and held in San Jose, California.

CHAPTER 5: COUNTY-WIDE SOLID WASTE PLAN AND IMPLEMENTATION

5.1 GENERAL PLAN

Based upon the information developed during the Demonstration Project, the container system will be expanded to service rural areas throughout the County. In addition to the container component, the County Solid Waste Management System will include alteration of the existing ultimate disposal patterns. For the fiscal year 1973 to 1974, approximately one million dollars has been appropriated to continue operating the existing system, build four additional container sites, and build a transfer station to replace the Benbow Landfill. The following fiscal year it is anticipated that the Solid Waste Management System will be completed with the construction of the final four container sites, the establishment of a new sanitary landfill to serve the entire County, and the closure of all other County maintained "semi-urban" landfills and rural, open dumps.

Each of these facilities will be constructed, owned, and operated by Humboldt County. Door-to-door collection will continue to be performed by private companies, under franchises issued by County and City governments.

A financial plan has been developed by Bartle Wells Associates, municipal financial consultants, for the County which includes a combination of revenue sources for long term system operation: Federal Revenue Sharing, Ad Valorem tax, and a special land use fee system available to California counties and cities (Appendix K).

5.2 CONTAINER SITES

At the time of this writing, the County Department of Public Works was involved in site selection and acquisition for the eight container sites to be developed in the rural areas not included in the Demonstration Project. Prime site locations are generally near the old open dumps that have historically served the area. Site acquisition will be via outright purchase, lease, and use permits from other public bodies.

As developed in Chapter 4, 40-cubic-yard containers will be employed at the sites. The site will use a "zig-zag" retaining wall, such that the empty container can be unloaded into position without having to move the full container that is to be taken to the landfill. The containers will be fitted with counterbalanced lids. They will extend about 18 inches above the dumping platform level so that a pickup truck tailgate can be lowered into the container to facilitate unloading.

During the course of the project, a similar container system was instituted in a County adjacent to Humboldt County. This system employed a collection vehicle and trailer such that two 40-cubic-yard containers could be serviced in a single route trip from the landfill. This technique has proved efficient, is consistent with the recommended exclusive use of the 40-cubic-yard containers, and will be employed in the expanded container system.

5.3 DISPOSAL SITES

At the beginning of the Demonstration Project, the vast majority of the County solid waste burden was disposed of at three landfills in the mid-County area, near the population center. One landfill is privately owned and operated by the franchised collector for the City of Eureka. The County operated two major landfills in this vicinity, Arcata and Table Bluff, one on the North and the other on the South shores of Humboldt Bay. The Arcata Landfill is no longer operational and will receive final cover, seeding, and landscaping by the summer of 1974. The Table Bluff Landfill will be operated until a new central landfill can be acquired and developed in the Eureka area. At that time, the Table Bluff Landfill will be permanently closed.

Concurrent with the establishment of this new central disposal facility, the rural open dumps will be closed as container sites are developed. During the past two years, 17 open dumps have been closed due to the establishment of container sites and dump site consolidation. During the next two to three years, most of the remaining 10 to 11 disposal sites will be closed as the new facilities are implemented.

5.4 RESOURCE RECOVERY

By focusing all of the solid waste in the County at a single disposal facility, the ability to support a resource recovery process is considerably improved. Most processes that are currently being tested or proposed are capital intensive and to make them economically feasible, large quantities of solid waste (or raw material) are generally necessary. With this in mind, the County initiated a program in March 1974 to determine the feasibility of an energy recovery facility capable of processing both municipal solid waste and wood waste from the local forest products industry. A companion to this effort may be the mechanical recovery of materials from the solid waste stream for marketing. The results of this study should be available by the summer of 1974.

Of more short-term benefit may be the results of an approximately \$40,000 contract the County has executed with the Northcoast Environmental Center. This organization has operated a recycle center where individuals may deliver certain separated and cleaned municipal waste material: glass, steel cans, aluminum, and newspaper. The contract requires that the Center operate recycle facilities at four locations, maintain accurate records of their operations, survey the markets for secondary materials, and conduct a public information program. An additional goal will be to determine what role such recycling efforts should play in the total County solid waste management effort. A portion of the County funding will be used to acquire certain equipment necessary for the recycling center's operation, such as a fork lift, baler, glass crusher, etc.

CHAPTER 6: COUNTY-WIDE SOLID WASTE FINANCIAL PLAN

Prepared by: BARTLE WELLS ASSOCIATES
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INTRODUCTION

Humboldt County is located on the northern California coast. About 87 percent of its 106,000 inhabitants live in an urban corridor adjacent to U.S. Highway 101, the Redwood Highway. The remaining residents are located in scattered small communities. House-to-house solid waste collection within the urban areas is provided by eight operators, who are city and county franchised. In the rural areas, residents have been delivering their solid waste to open dumps which were periodically burned. These open dumps fostered air and water pollution and created fire, health, and sanitation hazards.

In 1969 the county prepared a report on the rural solid waste management problem. With the help of a demonstration grant from the Environmental Protection Agency, the county installed containers at seven locations to replace the open dumps in the south county area. The containers are collected by the county and transported to a sanitary landfill developed as part of the south county system.

The south county container system has proved to be an effective solution to the rural solid waste management problem. The county has decided to extend the container system to the north county. The county also plans to develop a new sanitary landfill and construct a transfer station.

This report presents a financing plan to continue operation of the south county container system and to develop a new north county container system, sanitary landfill, and transfer station. The financing plan proposes that all new and existing phases of the solid waste management system will be coordinated as part of a unified countywide system.

THE COUNTY SOLID WASTE MANAGEMENT SYSTEM

The existing solid waste management system operated or supervised by the county includes 1) existing dumps which are burned or covered periodically; 2) the south county container system, comprising seven container sites and the Benbow disposal site; 3) eight county and city franchised operators collecting house-to-house in the urbanized areas; 4) major disposal sites at Table Bluff and Arcata; and 5) an incinerator owned and operated by one of the franchised operators.

Under the 1973/74 county budget, the county began to operate the disposal site at Table Bluff commencing January 1, 1974. The Arcata disposal site was closed, and Benbow disposal site (part of the south county container system) was closed by road failure and will not be reopened. The incinerator of the private operator is not included in the disposal process.

The county plans to continue to have all house-to-house collection undertaken by city and county franchised operators.

THE DEMONSTRATION GRANT PROJECT

With financial assistance from the Environmental Protection Agency, the county installed containers at seven sites in the south county area. The container sites are paved areas adjacent to county roads where drop boxes are located. Under the demonstration grant project, either one 40-cubic-yard drop box or five 8-cubic-yard boxes were located at each site. The engineers recommended that only 40-cubic-yard boxes be used permanently.

A sanitary landfill was developed at Benbow in the southern portion of the county, for disposal of wastes generated in the south county. The disposal site proved unsatisfactory and the access road became impassable during heavy winter rains. The county has decided not to reopen the Benbow disposal site. Instead a new central disposal site will be established, and a transfer station will replace the Benbow site.

THE COUNTY PLAN

In a report to the county presented in July 1973, and in the 1973/74 budget for solid waste management, the countywide solid waste management plan was presented. It proposes that the county:

- o Phase out all open burning dumps by December 31, 1975.
- o Continue the south county container system, closing the Benbow disposal site in 1974/75, and routing all collected south county waste to the Garberville transfer station for transportation to the Table Bluff disposal site.

- o Develop a north county container system with eight container sites, four to be developed during 1973/74 and four during 1974/75.
- o Close the Arcata disposal site, and improve the Table Bluff disposal site to meet state standards. Use Table Bluff as a central county-wide disposal site while locating and preparing a new central county disposal site.
- o Acquire and develop a central county disposal site from 1976/77 through 1978/79 when Table Bluff will be phased out.

The financing of steps such as those proposed is the responsibility of local government. Neither federal nor state programs assist in the financing of on-going operation and maintenance costs, or initial capital costs. Contracting with private operators under franchise agreements is an alternative to local government operation, but state public health agencies and state solid waste management regulatory agencies look to county government to supervise and enforce solid waste management standards.

TABLE 1
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
CAPITAL COSTS OF DEMONSTRATION GRANT PROJECT

<u>Equipment Purchased</u>	
2 Trucks and understructures	\$ 55,833
1 Compactor body	12,319
5 - 40 cubic yard containers	12,990
2 - 20 cubic yard containers	3,912
20 - 8 cubic yard containers	8,500
Optional items	539
Subtotal	\$ 94,093
State tax	4,704
Total equipment purchase	\$ 98,797
<u>Equipment Leased</u>	
1 Dozer @ \$1,732.50/monthly minimum	
Container sites (land and improvements)	\$169,201
Sanitary landfill (land and improvements)	\$129,000
Total Project Capital Cost (paid in cash)	\$396,998 say \$400,000
<u>Source: GEZR, consulting engineers.</u>	

TABLE 2
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
OPERATING COSTS OF DEMONSTRATION GRANT PROJECT

October 1972 through September 1973	Actual	With Leased Equipment
<u>Container System Collection</u>		
Equipment lease		\$20,336
Container sites maintenance	\$ 200	
Collection vehicle mileage @ 45¢/mile	10,289	
Compactors body maintenance	2,307	
8 cubic yard container maintenance	351	
40 cubic yard container maintenance	753	
Labor	9,007	
Subtotal Container System Collection	\$22,907	\$43,243
<u>Garberville Collection</u>		
Collection vehicle mileage @ 47¢/mile	\$ 5,218	
Labor	6,843	
Subtotal	\$12,061	\$12,061
<u>Disposal Benbow Site</u>		
Equipment lease	\$20,784	
Labor	12,458	
Interceptor trench construction	1,500	
Subtotal	\$34,742	\$34,742
Total South County System	\$69,710	\$90,046

Source: GEZR, consulting engineers.

TABLE 3
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
OPERATING COST ALLOCATION OF DEMONSTRATION GRANT PROJECT

	Labor/ Man Hours	Vehicle Miles Recorded	Weight Collected Tons
<u>Container Collection System</u>			
8 cubic yard	518	7,836	504
40 cubic yard	690	14,948	619
Garberville	912	11,088	1,084
Subtotal	2,120	33,872	2,207
Disposal (Benbow Site)	1,660	838 ¹	1,561 ²
Total	4,780		3,768

	Labor Cost	Equipment Cost ³	Total	Total ⁵
8 cubic yard	\$ 3,878	\$ 6,210	\$10,088	\$14,765
40 cubic yard	5,129	7,690	12,819	21,767
Garberville	6,843	5,218	12,061	18,772
Disposal	12,458	22,284 ⁴	34,742	34,642
Total	\$28,308	\$41,402	\$69,710	\$90,046

Source: GEZR, consulting engineers.

1 - Equipment hours for leased dozer. 2,207

2 - Weight received: County collected 1,283

Franchised collectors 140

State parks 138

Other 3,768 tons

3 - All equipment costs except amortization.

4 - Includes \$1,500 of interceptor trench construction.

5 - Assuming all leasable equipment was leased, and the \$20,336 of additional lease payment was distributed on the basis of mileage.

TABLE 4
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
CASH REQUIREMENT PROJECTION COMPONENTS

Disposal Costs	Table Bluff*		Arcata		Benbow		Existing Dumps			Central (Proposed)		
	1973/74	1974/75	1973/74	1974/75	1973/74	1974/75	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79
Capital Costs:												
Site correction	\$42,000	\$48,400	\$25,500	\$25,500	\$25,500	\$25,500	---	---	---	\$577,500	\$34,600	\$84,300
Operating Costs:												
Salaries	19,300	---	13,000	---	---	---	\$66,000	\$57,700	\$33,000	9,600	19,300	19,300
Equipment lease	10,800	---	24,000	---	---	---	13,200	11,600	6,600	5,400	10,800	10,800
Site rental	---	---	---	---	---	---	800	700	400	---	---	---
Total	\$30,100	---	\$37,000	---	---	---	\$80,000	\$70,000	\$40,000	\$15,000	\$30,100	\$30,100
2												
Other Costs	Garberville		North County System		South County System							
	Transfer Station											
Capital Costs:	1973/74	1974/75	1973/74	1974/75	1973/74	1974/75						
Land & improvements	\$218,000	---	\$265,000	---	\$157,000	---						
Vehicle modification	---	---	---	---	---	---						
Operating Costs:												
Labor			\$39,100		\$30,200	\$60,400						
Equipment lease			47,800		40,500	80,900						
Miscellaneous			3,600		---	---						
Special expenses			---		---	---						
Total			\$90,500		\$70,700	\$141,300						

*Excludes \$25,000 allowance for closing Table Bluff site in 1976/77.

TABLE 5

COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
ANNUAL CASH REQUIREMENTS PROJECTION

	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Capital Requirements:							
Disposal sites:							
Table Bluff	\$ 42,000	---	---	\$ 25,000	---	---	---
Arcata	48,400	---	---	---	---	---	---
Benbow	25,500	\$ 25,500	---	---	---	---	---
Existing dumps	---	---	---	---	---	---	---
Central (proposed)	---	---	---	577,500	\$ 34,600	\$ 84,300	---
Garberville transfer station	218,000	---	---	---	---	---	---
North County system	265,000	157,000	---	---	---	---	---
South County system	6,000	---	---	---	---	---	---
Subtotal	\$604,900	\$182,500	---	\$602,500	\$ 34,600	\$ 84,300	---
Annual inflation factor 7% per year	---	12,800	---	135,600	10,800	33,900	---
Total Annual Capital Requirements	\$604,900	\$195,300	---	\$738,100	\$ 45,400	\$118,200	---
Annual Operating Costs:							
Disposal sites:							
Table Bluff	\$ 30,100	\$ 30,100	\$ 30,100	\$ 15,000	---	---	---
Arcata	---	---	---	---	---	---	---
Benbow	37,000	---	---	---	---	---	---
Existing dumps	80,000	70,000	40,000	---	---	---	---
Central (proposed)	---	---	---	---	---	---	---
Garberville transfer station	---	90,500	90,500	15,000	\$ 30,100	\$ 30,100	\$ 30,100
North County system	15,400	70,700	141,300	90,500	90,500	90,500	90,500
South County system	90,900	76,400	76,400	141,300	141,300	141,300	141,300
Subtotal	\$253,400	\$337,700	\$378,300	\$338,200	\$338,300	\$338,300	\$338,300
Annual inflation factor 7% per year	---	23,600	53,000	71,000	94,700	118,400	142,100
Total Operating Costs	\$253,400	\$361,300	\$431,300	\$409,200	\$433,000	\$456,700	\$480,400
Grand Total Annual Cash Requirements	\$858,300	\$556,600	\$431,300	\$1,147,300	\$478,400	\$574,900	\$480,400

Source: GEZR, consulting engineers.

PROJECT COSTS

Solid waste management costs comprise capital costs and operating costs. Capital costs include land, equipment, and improvements. Operating costs include planning, administration, collection, transportation, disposal site operation, and equipment maintenance.

THE DEMONSTRATION GRANT PROJECT

From the reports of Garretson, Elmendorf, Zinov, Reibin (GEZR), consulting engineers on the demonstration grant project, an estimated \$400,000 of capital goods and facilities were acquired to institute and equip a rural drop box system in the south county area. Approximately \$100,000 of rolling stock was purchased outright at the beginning of the project. A dozer was leased. Table 1 shows total capital costs for the project.

The operating costs for the 12 months, October 1972 through September 1973, were \$69,710, including \$20,784 of dozer lease payments. Assuming all leasable rolling stock has been under lease, an additional \$20,336 would have been expended for lease payments, bringing the operating costs to about \$90,000 per year. Table 2 shows these costs. Table 3 allocates operating costs among system components in the 12-month period ending September 1973. These tabulations indicate an order of magnitude for both capital investment and operating costs for this type of project.

CAPITAL COSTS

Table 4 illustrates capital costs of each disposal, transfer, and container system. There are \$1,508,800 of capital costs shown at 1973 price levels. They include only the land and improvement costs. The equipment capital costs have all been deferred in the form of lease payments which appear under annual operating costs. No allowance is made for moneys realizable by the county from closing of a disposal site and selling the land.

The real cost of disposal site land over time is probably zero. Disposal sites which are selected on the basis of accessibility, along with all other considerations, would have a resale value when closed at least equal to original cost. If not sold, the sites may be used for parks or other public purposes and eliminate equivalent capital expenditure.

Table 5 projects capital costs over time, and includes a 7 percent per year inflation factor over the 1973 costs shown in Table 4. The inflation factor increases the capital costs to \$1,701,900. The majority of the costs after 1974/75 are for the proposed central disposal site which would replace the Table Bluff site. Earlier purchase of land or options to purchase land may reduce the inflation component of that site's costs.

ANNUAL OPERATING COSTS

The labor, maintenance, and materials requirement of a solid waste management system combine to become the annual operating costs. These are the direct costs of expended resources related to collection, transportation, and disposal of waste. There are also the indirect system costs which include administrative supervision and overhead for services provided by county government.

Table 4 shows the component costs of system operations at 1973 price levels. The inflation factor, 7 percent per year, is added in Table 5 to illustrate anticipated costs in the future.

The county's annual cost of operating a countywide disposal system with 13 container sites, a disposal site, and a transfer station will be about \$338,000 in 1973 dollars and increase to \$480,000 including inflation by 1979/80. The inflation allowance has been applied annually to all costs, including equipment leases. In practice equipment payments tend to remain level for three to seven years, and step up only when the equipment is replaced. The annual inflation allowance used in the projection is a form of budgeting in advance for the higher cost of replacement equipment.

CAPITAL REPLACEMENT RESERVE

Good utility management principles dictate that capital components be maintained in good working order to optimize useful life. The major capital components of solid waste management systems are land, improvements, and equipment. Land is assumed to maintain sufficient value to fund its own replacement. Disposal site improvements and container site improvements may need replacing over time. Equipment is used up over its expected service life.

Table 6 lists the capital expenditure schedule for all components of the system other than leased equipment. In order to fund the eventual replacement of these components and make other improvements to the system as needed, a capital reserve fund is recommended. The capital reserve fund will serve about the same functions as a depreciation allowance in utility accounting practice. Like the depreciation allowance, it should reflect the original cost and relative life of the improvements and equipment to be replaced. The allowances proposed in Table 6 assume annual deposits of 5 percent of the cost of disposal and container site improvements, 5 percent of the cost of the transfer station, and 20 percent of the cost of purchased equipment.

Equipment to be acquired for use in the future is all assumed to be leased. The lease contract is assumed to cover the useful life of the equipment. No separate replacement charge is made because it is included in the equipment lease payment.

TABLE 6
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
CAPITAL REPLACEMENT RESERVE

	Disposal Site Improvements	Transfer Station	Container Site Improvements	Equip- ment	Capital Reserve Contri- bution	Total Net Investment*
1973/74	\$ 54,000	\$ --	\$123,100	\$100,000	\$28,900	\$248,200
1974/75	115,900	200,000	157,000	59,200	64,300	716,000
1975/76	25,500	--	157,000	--	73,400	825,100
1976/77	--	--	--	--	73,400	751,700
1977/78	102,000	--	--	--	78,500	775,200
1978/79	34,600	--	--	--	60,300	749,500
1979/80	84,300	--	--	--	64,500	769,300

*Net investment end of year.

FRANCHISED COLLECTION COSTS

The county has franchised seven operators to collect solid waste in nine areas. In addition, the City of Ferndale franchises its local house-to-house collection to a private operator. The franchised areas are concentrated along U.S. Highway 101, the Redwood Highway, and in the urbanized areas in and around cities. The Willow Creek-Hoopla area is the only franchise which is off the U.S. 101 corridor. According to information provided by the county's Department of Public Works, the franchise collectors' charges per 30-gallon container picked up once a week range from \$1.50 to \$3.75 per month. There is an indication of commercial waste volume collected by these operators in the number of commercial accounts served as shown in Table 7.

Statistics cited in Table 7 were provided by franchised collectors. Because there is no mandatory collection ordinance in the county or any of the cities, any revenue projections made using the Table 7 statistics must be judged conservative. No information has been provided on actual collection.

To project from the information shown in Table 7, Bartle Wells Associates has assumed that 1) each commercial account produces twice as much revenue as a residential account, 2) the average monthly rate of \$3.00 per 30-gallon container picked up once a week, and 3) each residential account uses only one 30-gallon can. Collection cost is estimated as follows:

Estimated annual revenue	\$827,000
Disposal costs (\$0.50 per cubic yard)	- 88,600
Balance of revenue	\$738,400
Assumed profit (10 percent of gross)	- 82,700
Estimated collection cost	\$655,700

Collection cost appears to average \$28.54 per year per residential account. Disposal costs of \$3.86 per year per residential account bring total cost of collection and disposal to about \$32.40 per year per residential account. The disposal charge, \$0.50 per cubic yard, is currently collected by the county as gate fee for loose waste.

REVENUE SOURCES

The county has a variety of revenue sources to choose from to finance the project. These sources include general fund allocations, gate fees, service charges, collection charge, federal revenue sharing, and state and federal payments. Each of these methods will be discussed in this section.

DETERMINING BENEFIT

An important feature of an equitable financing plan is distributing costs according to benefit received. Levels of benefit vary geographically among: 1) container system areas, 2) franchised collection areas, and 3) state, federal and other public park-camping-picnicking areas.

The container system areas benefit by having a convenient, local disposal point from which the county transfers waste to the disposal site. The container site is maintained by the county, eliminating the fire and health hazard previously extant from open burning dumps. A gate fee or area-wide indirect charge would be an appropriate way to charge for these benefits.

The franchise collection areas are benefited by having house-to-house collection service available on a weekly or semi-weekly basis. The removal of garbage from each dwelling and commercial establishment eliminates the nuisance, health, rodent, and vector hazards which are present where garbage is stored. The benefit of collection includes disposal service. In franchised collection areas of Humboldt County, the disposal service is provided by the county at some cost to the franchised collector. Collection and disposal are ultimately paid by the individual collection customer as part of the collection charge.

Recreation areas in the county, operated by federal, state, or local governments, are seasonally benefited by the container system and the disposal sites of the county. The recreation site operators remove garbage to the nearest container or disposal site. Some of the governmental agencies providing recreational facilities are able to contract with county government for their fair share of the costs of operating solid waste facilities. U.S. Forest Service has advised Bartle Wells Associates that Six Rivers National Forest will negotiate with the county as soon as the open burning dumps at Willow Creek and Orleans are closed. The U.S. Forest Service is able to budget up to the cost of creating and operating separate facilities.

Direct use of disposal site is also a benefit. The direct disposal site user would overload the collection system or the container system were he to place excessive wastes in his standard container. The county system provides the opportunity to dispose of excess solid wastes directly at the disposal site. For that special privilege or special benefit, a gate fee is charged.

The proposed south county transfer station promises to benefit many users of the system. By replacing the Benbow disposal site, it will reduce the cost of hauling for container customers. It will also save franchised collectors and their customers the cost of hauling to Table Bluff for disposal. A gate fee at the transfer station would pass the cost fairly to all customers served.

Certain industrial and commercial solid wastes require special handling due to their bulk, toxicity, or other dangerous nature. Such wastes should be charged on a case-by-case basis. It would be reasonable to charge a direct fee for all handling and disposal costs plus 10 percent for administration and supervision.

GENERAL FUND ALLOCATION

General fund allocation spreads costs among all property owners in the county. All property, regardless of use, shares in paying for the general benefit services provided from general fund expenditures. Ad valorem taxation is the major revenue source for the county general fund.

Ad valorem taxation is a good method of distributing cost where waste generation is closely related to assessed value. It is a poor method where wastes from major generators are difficult to process or exceptionally valuable for recycling.

Tax rates were effectively frozen by passage of SB 90 and AB 2008 by the state legislature. The county's general fund tax rate is limited to that levied in 1971/72; it may be increased in proportion to population growth and increases in the state consumer price index, or by popular vote.

The general fund allocation to solid waste management activities is equivalent to a rate of 6.6 cents per \$100 assessed valuation.

GATE FEES

Gate fees are charges collected at disposal, container, or transfer sites for the privilege of dumping. Such fees have rarely reflected the costs of disposal only. Gate fees may pay all solid waste management costs. The fee is arrived at by dividing revenue needed by the tonnage of waste to be disposed. Gate fees should be set at levels which encourage facilities' use.

When gate fees are collected, the first cost to be considered is the salary of the gate attendant as an additional cost of disposal. At low volume sites or container sites, the cost of collection may be prohibitive, unless the attendant can perform other functions such as covering refuse in the landfill or compacting refuse in the container.

SERVICE CHARGES

Service charges, collected through a schedule of land classification, are a new revenue source created by the California Legislature in 1972. Referred to as AB 64, this legislation added Sections 25210.77 (e) and (f), 25830, 25831, and 38790 to the Government Code. Basically, the legislation provides that county governments and county service areas may engage in the collection as well as the disposal of solid waste. The costs of providing such services may be collected from fees and charges levied against land, based on the solid waste generation classifications applied to the land. Cities may also use the same land classification method for collecting service charges for solid waste management. Further, the delinquent fees become liens against the land on a parity with delinquent taxes. The same tax sale provisions applied to delinquent property taxes are applied to delinquent service charges.

The service charge system requires much data collection. There are approximately 57,000 taxable parcels or property in the county. Each parcel has an individual sheet on which is recorded all pertinent information about land, timber, minerals, and improvements. Only limited information from this sheet is currently in the county's computer, i.e., total values of land and improvements, secured and unsecured values, and ownerships. By limiting the search through the assessor's roll to improved parcels, and by creating a land classification form which would permit the recording of parcel numbers and information pertaining to solid waste generation, a manual search of the individual parcel sheets in the county assessor's office would yield complete countywide data. The gathering of data would require about two months. Updating could be accomplished through building permit procedures.

Once this classification information has been organized, the county would be able to mail a bill for the service charge annually with the tax bills to all unincorporated land in the county.

The county has no power to levy the service charge on incorporated property directly. There are two methods of collecting equivalent revenue inside cities:

1. Under Section 38790.1 of the Government Code, a city may collect fees on the same basis as the county by agreement between city and county. The county's service charge and land classifications could then be applied within the city, and the revenue allocated among city and county services.
2. A city could, through agreement or contract, agree to pay the county a set annual fee for services provided by the county, without reference to city revenue sources.

TABLE 7
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
FRANCHISE AREA CUSTOMERS

Franchise Area	Mo. Rate for 30 Gal. Container Per Week	Commercial Accounts	Resi- dential	Total Customers
Humboldt Sanitation (McKinleyville-Orrick)	\$3.75	150	1,250	1,400
Blue Lake Garbage (Samoa Blue Lake Fieldbrook)	3.00			1,150
(Willow Creek Hoopa)	3.00			251
Arcata City Garbage	3.10			6,000
Eureka City Garbage	2.35	800	8,200	9,000
Eel River Garbage (Fortuna)	1.50	150	2,850	3,000
Ferndale				500
Emery Moore (Myers Flat)	2.00			100
Phillip Koshan (Garberville-Redway)	1.75	91	290	381
Total		1,191	12,590	21,782

Source: Department of Public Works, County of Humboldt, 2/1/74. Customer count provide county by franchise collectors.

Attached as Exhibits A, B, and C, are the Glenn County Ordinances 547 and 551 and the joint exercise of powers agreement between the county and the Cities of Willows and Orland. Glenn County adopted the attached ordinances and entered into the joint exercise of powers agreement to take advantage of the AB 64 legislation in 1972. The county's program has been well received and is operating smoothly.

San Bernardino County adopted a service charge ordinance with land classifications in 1973, attached as Exhibit D. The metropolitan portion of the county is excluded from the service charge as an area for which service is provided and service charge levied. Further, some of the very sparsely populated areas of the desert regions of the county have also been designated no-service-charge areas. However, the more populous desert areas have been provided with county-operated disposal sites. The service areas surrounding these disposal sites have been divided into six use categories according to the solid waste generation associated with each use. The service charges have been set according to these categories. Cities located within service areas where AB 64 type service charges are levied on unincorporated lands have agreed to pay the county an annual lump sum for the cities' fair share of disposal costs. The cities, in turn, are collecting the moneys from the house-to-house collectors.

COLLECTION CHARGES

Collection charges for house-to-house pick-up are usually collected by private haulers. Monthly charges to customers vary from \$1.50 to \$3.75.

Franchise fees paid by collectors are usually related to monthly charges. The city or county franchising the private hauler may charge a set fee or a percentage of gross revenue for the franchise. The franchise fee charged by the franchising government is not to be confused with the gate fee charged for disposing of collected solid waste. The franchise fee is a charge for the exclusive right to collect garbage in a defined area.

FEDERAL REVENUE SHARING

Federal revenue sharing is a fifth revenue source. The board of supervisors decided to use this revenue source to pay for expanding the container system countywide. The revenue sharing funds are budgeted to meet solid waste management costs in the present fiscal year. This source could also be used to meet capital needs as they arise. Federal revenue sharing money is not being considered as an operating revenue source in this report, because it is funded only through 1976.

STATE AND FEDERAL PAYMENTS

Payments from state and federal agencies for solid waste collection and disposal are a sixth revenue source. Contractual arrangements with state and federal government agencies (parks and recreation facilities) for use of county solid waste disposal facilities, especially on a seasonal basis, should offset costs created by such agencies' waste loads. Federal policy requires all federal agencies to use local facilities where available. The maximum amount a federal agency will pay for local service is the cost of providing and operating separate facilities at the federal agency's expense.

REVENUE COLLECTION COSTS

The costs of collecting revenues must be considered in determining which revenue sources to use. Three billing methods are available to the county: billing in conjunction with the county tax bill, direct monthly billing, and a combined public service billing system.

The county tax collection system is currently used to collect only ad valorem taxes. The same system would be the least costly method of collecting the service charge. The added costs of service charge billing are: 1) gathering land classification data, 2) computer programming to convert land classification information into service charge billings, and 3) collecting the money. The billing would be annual, on a separate bill, mailed with the property tax bills.

Use of a billing system other than the county tax bill for collecting service charges is not recommended. Were the billing to be monthly, the additional postage would be at least \$48,000 per year under the new postal rates, assuming 39,876 parcels of land in unincorporated areas. This estimate indicates 15,731 of 55,607 taxable parcels of land in the county are located within cities. In addition, the clerical staff requirements to process the bills monthly would add at least a five person group costing \$50,000 per year. There would also be additional computer programming required.

The county might investigate the feasibility of a public service billing system. The utility service billing for sewer, water, solid waste management and other services would be handled by the county. Special districts throughout the county would have a centralized billing system available. There are four special districts in the county providing sewer service only, and seven special districts serving water only. Among these districts there may be duplication of personnel and equipment. Consolidation could provide savings which would reduce service costs and increase efficiency.

Collecting gate fees costs approximately \$10,000 per year per attendant. Where franchised collectors, industrial, and commercial customers are billed monthly, rather than paying for each load, the cost of collecting gate fee revenues rises by the cost of that billing system. However, the volume of moneys handled by the gate attendants are reduced. The attendant would weigh and note the volume of waste to be billed.

Should there be no billing, but strictly a cash gate fee collection system, there would be some security and insurance costs. An estimate of the cash balances held at the site would be required to properly assess the levels of insurance and security required.

Gate fee collectors can also gather statistical information. By keeping a record of the number and types of loads coming to the disposal site, by size, class, and frequency, information about the life of the site and potential income from the site can be assembled. Some recycling information might also be gleaned from such data.

Operating costs in Table 6 and 7 for both Table Bluff and the proposed central landfill include gate attendant costs.

RECOMMENDED FINANCING PLAN

OBJECTIVES

The financing plan recommended in this report is intended to serve as a guideline for several purposes.

1. Providing an institutional framework within which a countywide solid waste management plan can function.
2. Financing capital costs for the north county container system, the central disposal site, and the transfer station.
3. Providing operating revenues to meet operating costs of the container systems, disposal sites, and transfer station.
4. Building a capital reserve to maintain the value of the utility.

INSTITUTIONAL ARRANGEMENTS

In order to develop a comprehensive countywide solid waste management plan without restraint by political boundaries within the county, an institutional arrangement would have to be negotiated. There are a number of special district forms of government from which to choose. However, the most expedient relationship would be a county-cities joint exercise of powers agreement.

The whole land area of the county is included in the solid waste management plan under consideration. The financing plan being recommended in this report is able to fulfill the financial and political needs of the whole county by creating an agreement between the county government and the city governments.

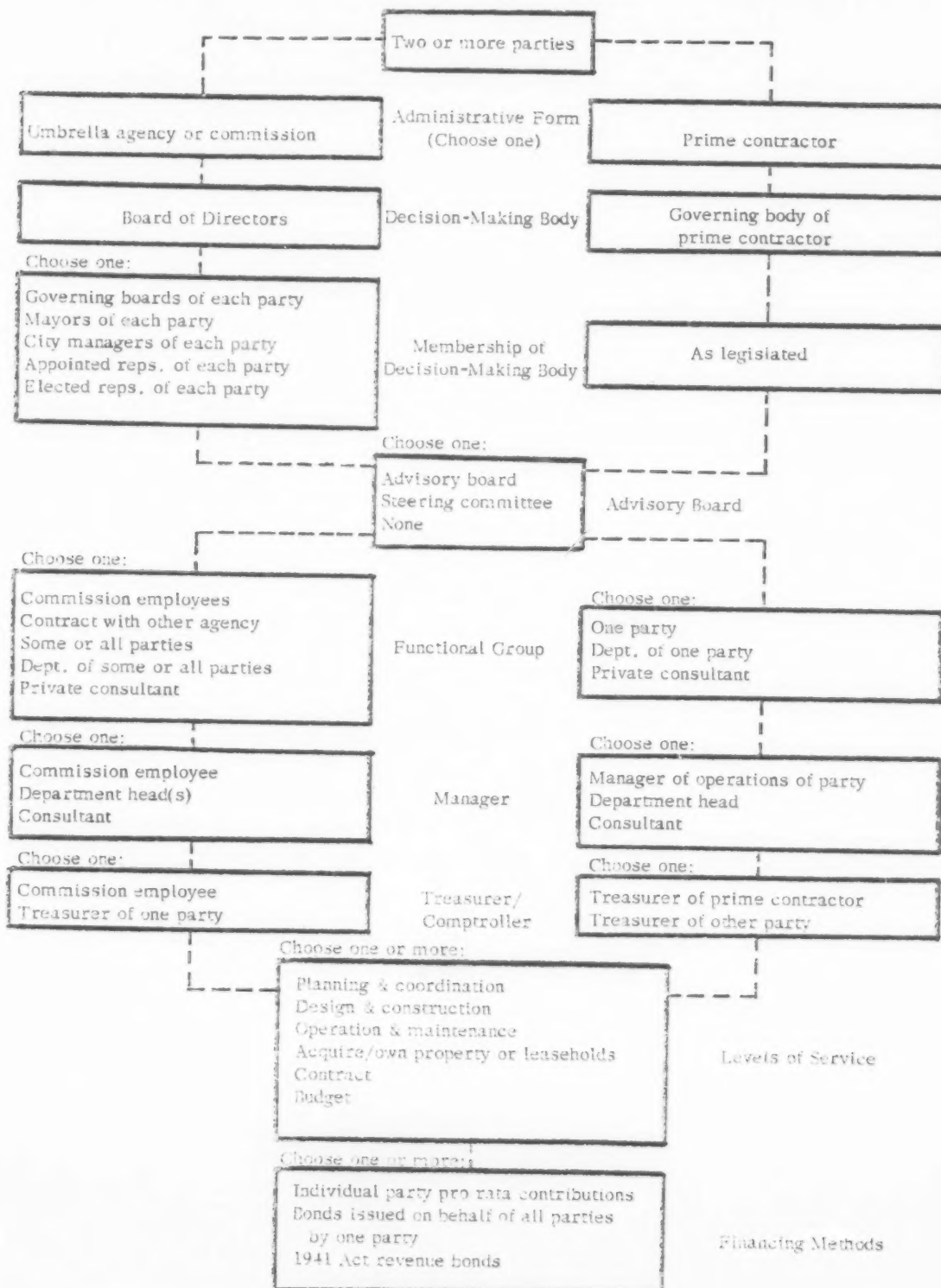
The basic statutory authorization for a joint exercise of powers agreement is contained in Chapter 5 of the Government Code (Sec. 6500 ff). These broad powers cover many areas of intergovernmental arrangements including those for solid waste management. Two agencies or more, with powers to manage solid waste are necessary to create the joint powers agreement.

Preparation of a joint powers agreement involves choosing among many alternatives. Decisions should be made on alternative arrangements, including, but not limited to, those listed in Table 8.

The designation of the agency to carry out the agreement is critical to the success of the joint powers agreement. This administrator may be one or more of the parties, or may be a commission or board created by the agreement. Under a joint powers agreement, therefore, two choices exist for the solid waste management function: 1) a contractor agency -

TABLE 8
COUNTY OF HUMBOLDT SOLID WASTE MANAGEMENT
JOINT POWERS AGREEMENTS DECISION STEPS

JOINT POWERS AGREEMENTS



one or more of the parties administers or carries out the agreement, or
2) an umbrella agency - the newly formed agency/authority/commission
administers or carries out the agreement.

Once the administrator is chosen, the parties must select among other
alternative functions to complete the agreement.

1. The first step is to designate the decision-making body of the
entity. The decision-making body, or the persons who have the auth-
ority or power to administer the agreement, may be selected in any
manner to which the member parties agree.
2. Other bodies may be formed to assist the decision-making body carry
out its tasks. For example, an advisory group which represents
additional points of view may be created to advise the governing
board and to provide liaison between the commission and participating
agencies. Franchised collectors may be represented on the advisory
group.
3. A treasurer or comptroller responsible for fiscal affairs should be
appointed. Usually this will be the treasurer of the managing
entity or, under the umbrella agency approach, one of the partici-
pants.
4. A staff to carry out the daily functions of the agency must be des-
ignated. The administrator agency may choose to provide the speci-
fied services itself, through its own hired employees, may delegate
some or all of the functions to an agency under its jurisdiction,
or may contract with another public or private group.
5. To facilitate performance under the agreement, a manager or coor-
dinator should be provided by the administrative agency or employed
separately by the commission.
6. The levels of service, or specific joint powers which are to be exer-
cised, should be determined in this agreement.
7. The financial powers of the umbrella agency or contractor agency
under joint powers agreements for solid waste management is limited
largely to the resources of the individual parties to the agreement.
Annual operating and maintenance costs are shared by the members in
any manner preferred. Capital costs, similarly, must also be allo-
cated, and may be met by individual contributions, bonds issued by
one party on behalf of all members of the agreement, or revenue bonds
under the Revenue Bond Law of 1941.
8. Finally, parties to the joint powers agreement must decide upon own-
ership and capacity rights, methods to resolve disagreements in
administration, duration of agreement, method of discussion, and
general rules and regulations regarding use of the joint system.
Reference is made to the copy of the Glenn County JPA attached as
Exhibit C.

CAPITAL COST FINANCING

Capital costs can be met from funds on hand or borrowed funds. Capital costs can be deferred by leasing equipment instead of purchasing it outright.

Initial capital investment in the existing south county container system has come from federal demonstration grant moneys and county general fund allocations. The 1973/74 budget includes federal revenue sharing moneys for north county container system capital investment, south county container system improvements, and disposal site closures and improvements.

Lease payments for equipment and capital for the balance of the project described by the consulting engineers will be generated by the revenue structure. The combination of general fund allocations, service charges, and gate fees can meet all capital costs of the proposed system not already paid or funded.

OPERATING REVENUES

Operating costs must also be met from current revenues. Revenue sources for solid waste management at the county level in California are general fund allocations, gate fees, service charges, and collection charges. Annual revenues from all sources must meet annual expenditures. Collection charge revenues, other than gate fees paid by franchised collectors, are not available in Humboldt County because the county provides no collection service. Franchise fees (about 2 percent of gross revenue) are the only other revenue realized by the county from house-to-house collection service.

REVENUES AND EXPENSES

The proposed revenue sources recommended in Table 9 pay costs as they are incurred and build a fund to complete the system. Table 10 develops these revenue recommendations into a seven-year projection of revenues and expenditures.

The general fund allocation is projected at the present level, \$205,000, or a tax rate equivalent of about 6.67 cents per \$100 of assessed valuation. This is the current level of tax moneys used for solid waste management. The proposed plan would maintain the present allocation to the end of the capital investment period, and then decrease it.

To assure full system use, mandatory collection ordinances applied to areas where franchised operators currently collect garbage weekly or semi-weekly, are strongly recommended. Mandatory collection assures the community of timely waste removal in an efficient, regulated manner which meets public health standards, and generally reduces illegal dumping. Homeowners benefit because they use a service which is available,

TABLE 9
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
REVENUE SOURCES

I. Ad Valorem Taxes:

Assessed value - 1973/74, \$307, 596, 430 (secured only)

- A. 1973/74 general fund solid waste management budget -
6.6¢/\$100 A. V. or \$201, 672.
- B. 1974/75 operating costs \$361, 300 = 11.7¢/\$100 A. V. tax rate.
- C. 1974/75 grand total cash requirement \$556, 600 =
18.1¢/\$100 A. V. tax rate.
- D. Recommended tax rate 6.6¢/\$100 through 1976/77.

II. Service Charge: Dwelling Unit Equivalent Basis

Dwelling unit count:

County total	35, 985	
Inside cities		15, 892
Outside cities		20, 093
Franchised area customers	21, 782	
Residential		19, 822
Commercial		1, 960
DUE's Zone A	23, 742	
Rural area customers	17, 763	
Residential		16, 163
Commercial		1, 600
DUE's Zone B	19, 363	

- A. 1974/75 operating costs \$361, 300 = \$0.45/month Zone A and
\$1.05/month Zone B per DUE.
- B. 1974/75 grand total cash requirement \$556, 600 = \$0.65/month Zone A and
\$1.60/month Zone B per DUE.
- C. Recommended service charges are \$0.50/month Zone A and \$1.25/month
Zone B per DUE producing \$433, 000 of annual revenue.

III. Gate Fee:

106, 000 people @ 0.6 tons per capita per year = 63, 600 tons =
691, 000 cubic yards @ 184 pounds per cubic yard.

- A. 1974/75 operating costs \$361, 300 = 52¢/cubic yard.
- B. 1974/75 grand total cash requirement \$556, 600 = 81¢/cubic yard.
- C. Recommended 50¢/cubic yard for 177, 242 cubic yards conservatively
estimated from franchised collectors = \$88, 600.

TABLE 10
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
ANNUAL REVENUE AND EXPENSE PROJECTION

	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Revenues							
Property taxes ¹	\$201,672	\$205,000	\$205,000	\$ 205,000	\$100,000	\$100,000	\$ 50,000
Service charge ²	--	433,000	433,000	433,000	433,000	433,000	433,000
Gate fee ³	--	88,600	88,600	88,600	88,600	88,600	88,600
Revenue sharing	698,656 ⁴	--	--	--	--	--	--
Total	\$900,328	\$726,600	\$726,600	\$ 726,600	\$621,600	\$621,600	\$571,600
Expenses							
Capital costs ⁵	\$604,900	\$195,300	\$ --	\$ 738,100	\$ 45,400	\$118,200	\$ --
Operating costs ⁶	253,400	361,300	431,300	409,200	433,000	456,800	480,400
Capital replacement cost ⁶	28,900	64,300	73,400	73,400	78,500	60,300	64,500
Total	\$887,200	\$620,900	\$504,700	\$1,220,700	\$556,900	\$635,300	\$544,500
Net Revenue	\$ 13,100	\$105,700	\$221,900	\$ -- ⁷	\$ 64,700	\$ (13,700)	\$ 27,100
Cumulative Net Revenue	\$ 13,100	\$118,800	\$340,700	\$ --	\$ 64,700	\$ 51,000	\$ 78,100
Cumulative Capital Replacement ⁸	\$ 28,900	\$ 93,200	\$166,600	\$ 86,600	\$165,100	\$225,400	\$289,900

1 - Property tax equivalent at 6.67¢/\$100 assessed value.

2 - Service charge of \$0.50 per month Zone A and \$1.25 per month Zone B per DUE.

3 - Gate fee @ 50¢/cubic yard escalated at 7 percent per year.

4 - 1973/74 only.

5 - From Table 5.

6 - From Table 6.

7 - Current revenues, \$726,600, plus accumulated net revenues, \$340,700, plus accumulated capital replacement costs, \$166,600 and \$73,400 current capital replacement cost equal \$1,307,300, leaving \$31,200 remaining in cumulative capital replacement.

8 - Capital replacement funds available as needed to upgrade and replace capital facilities and equipment.

and are assured that their neighbors are also using the service. Franchised operators benefit by being able to set their collection routes to pick up from every house on every street within their franchised area. The county benefits where available collection service is used instead of unattended container stations.

Such mandatory collection ordinances could be required by the county-cities joint exercise of powers agreement. Further, the joint exercise of powers agreement should clearly confer the operation and administration responsibilities for solid waste throughout the county upon the county government. Cities would retain the income from franchising house-to-house collection at the current franchise fee rate or 2 percent of gross franchise collector revenues within the city limits, whichever is greater.

The principal new source of revenue proposed is a service on each dwelling unit equivalent (DUE). A DUE is 1.2 tons per year, which is the amount of domestic waste generated by an average household of 2.9 persons. DUE's can be assigned to commercial and small industrial establishments according to activity, number of employees, or amount of space under roof. This will result in equitable assignments of DUE's to retail stores, restaurants, service stations, and the like.

Industries generating special wastes as a by-product of manufacturing can be charged individually according to the characteristics of the waste and need for special handling.

Service charges based on DUE's can vary from area to area. One charge can be levied in rural areas where all system costs must be paid from general fund allocations or service charges. A smaller charge can be applied in areas of franchised collection where householders contribute directly toward system costs through monthly collection charges.

To raise the revenues required for the Humboldt County program, two levels of land use fees are recommended.

1. \$0.50/month/DUE, or \$6/year/DUE in areas with mandatory franchised collection.
2. \$1.25/month/DUE, or \$15/year/DUE in rural areas without franchised collection.

The joint exercise of powers agreements would provide for the county to collect service charges within each city or for the city to pay an annual sum equivalent to the service charges. Other provisions in the agreement would deal with regulation of franchised collectors in and out of the cities, life of franchises, and procedures for obtaining and renewing or altering the boundaries of franchises.

The proposed service charge will produce about \$433,000 per year. The county tax collector can bill the fees with property taxes to minimize the cost of collection.

The franchised operators of house-to-house collection systems will pay a disposal charge in the form of gate fees. The gate fee is proposed at 50 cents per cubic yard loose or about \$5.45 per ton. The revenue estimated from this source is conservatively projected at \$88,600 with a 7 percent per year escalation. The revenue estimate is conservative because 1) only franchised collectors' gate fees have been estimated, and 2) the volume of waste from franchised collectors was estimated at only one 30-gallon container per week per residential customer and two per commercial customer. Gate fee would be paid at the point of entry to the disposal system, either at the transfer station or at the landfill.

Franchised operators, who formerly used the Benbow disposal site, have been assumed to be permitted to use the Garberville transfer station, when constructed. These operators have not been charged a differential for using Benbow. It is proposed that they be permitted to use the Garberville transfer station at no extra charge. However, if these operators have received a rate increase due to the haul to Table Bluff in the interim, the county should either collect that increased revenue for hauling to Table Bluff disposal site, or the rate charged by the operators should be reduced.

The revenue structure is designed to spread costs on the basis of benefits, without disturbing existing revenue structures. Therefore, we have proposed:

1. General fund allocations continued at \$205,000 through 1976/77, and then declines.
2. Service charges of \$.50 and \$1.25 per month per DUE.
3. Gate fees of \$.50 per cubic yard, or \$5.45 per ton.
4. Joint exercise of powers agreement between the cities and the county under which the county administers and operates all solid waste management in Humboldt County.
5. Mandatory collection in all franchised areas of the county.

TABLE 11
COUNTY OF HUMBOLDT
SOLID WASTE MANAGEMENT
FRANCHISED COLLECTORS REVENUE AND EXPENSE ESTIMATE¹

	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Rate per 30-gallon can per month	\$3.00	\$3.20	\$3.45	\$3.70	\$3.95	\$4.20
Revenues	\$827,000	\$884,900	\$946,800	\$1,013,100	\$1,083,900	\$1,160,000
Expenses						
Disposal cost	\$ 88,600	\$ 94,800	\$101,400	\$ 108,500	\$ 116,100	\$ 124,300
Operating cost ²	655,700	701,600	750,700	803,300	859,500	919,700
Total	<u>\$744,300</u>	<u>\$796,400</u>	<u>\$852,100</u>	<u>\$ 911,800</u>	<u>\$ 975,500</u>	<u>\$1,044,000</u>
Net Revenue Before Taxes	\$ 82,700	\$ 88,500	\$ 94,700	\$ 101,300	\$ 108,400	\$ 116,000

¹ - From Table 9 and discussion under the side heading "Franchised Collection Costs."

² - Includes franchise fee of 2 percent of gross revenue city government.

APPENDIX A

SUMMARY OF COLLECTION EQUIPMENT SPECIFICATIONS

Truck Chassis (2):

Type - International COF-4070A.
Maximum Gross Vehicle Weight - 50,000 pounds.
Maximum Gross Combination Weight - 79,000 pounds.
Wheel Base - 218 inches.
Frame - 10-1/2 inches by 1/2-inch web, heavy aluminum frame with steel cross members.
Engine - 8V71 N290-horsepower Detroit Diesel Engine equipped with Jacobs Engine Brake
Cab - 50 inches BBC aluminum cab-over.
Front Axle - 18,000 pound minimum with hydraulic power steering and heavy duty front springs.
Rear Axle - SQHD Timken 38,000 pound with road geared speed not to exceed 55 miles per hour.
Suspension - 38,000 pound capacity RSA Hendrickson rubber load cushion rear suspension with heavy duty aluminum equalizer beams.
Transmission - Five-speed synchromesh with fifth speed direct drive.
Auxiliary Equipment - Right and left rear-view mirrors with heaters, heavy-duty front-end tow hoods, electric backup type horn alarm, air horn mounted on cab roof, and cab air conditioner.
Guaranteed Performance Under Gross Load Conditions Per California Legal Load Limits - 10 miles per hour on 15-percent grade, first class highway and on 8-percent grade packed gravel road.

Understructure (2):

Type - Bowles standard hydraulic tilting frame and cable winch pull-on system.
Capacity - 30,000 pound maximum gross lifting capacity including container and payload.
Operation - Capable of servicing drop boxes from 16 to 22 feet long and compatible detachable front loaders; will mount, secure during transit, and unload units.
Design - The tilting frame consists of a heavy structural frame hinged at the rear for hoisting, with rollers on each side to support detachable bodies, automatic roller locks at front, automatic side locks to hold container rails to frame, double-acting hoist cylinders capable of

raising the frame to approximately 45 degrees and with hydraulically-operated winch to pull detachable body on frame.

Hydraulic System - Power is transmitted from a transmission mounted power take-off through a high performance vane-type pump. Relief valve equipment prevents excessive pressure, and the size, volumetric capacity, and pressure rating of all components are calculated to assure smooth and efficient operation of the system.

Intersystem Connection - Quick-disconnect hydraulic couplings are provided at the rear of the frame for pressure and return lines to the detachable-body hydraulic system.

Controls - Hoist and winch operation is accomplished by engaging the power take-off and operating hydraulic directional valve levers located at the front of the frame on the driver's side by the cab.

Retaining Device - A mechanical brake device prevents winch movements if the power is disengaged during pull-up and set-down operations.

Body Locking Device - Automatic roller locks at front and automatic locks at rear securely hold on- and off-units.

Detachable Front Loading Compaction Body (1):

Type - Bowles standard detachable front-loading compaction body capable of being loaded and operated on a Bowles tilting roll-off frame.

Capacity - 22 feet partial-pack 42-cubic-yard capacity.

Operation - Capable of hoisting and emptying 1-cubic-yard to 8-cubic-yard storage bins into hopper, where a compaction blade will sweep the waste towards the rear of the body.

Packer Body - Steel design capable of withstanding normal compaction pressures; hopper floor, 1/4-inch sheet steel; body floor and side walls below guide rails, 10 gauge; body top and side walls above guide rails 12 gauge; exterior body posts to reinforce sides; hold-back teeth to retain load during transit.

Packer Blade - First stage cylinder exerts 70,000 pounds or more of horizontal thrust and travels a minimum of six inches beyond rear of hopper openings.

Hopper Cover - Horizontal type mounted on guides and operated by hydraulic cylinders.

Front Loader - Capable of hoisting 6,000 pounds (container and waste) into hopper, with relief valves to prevent overloading; arms shall be over-door type.

Discharge Door - Barn-type door fitted with heavy-duty hinges, safety chain, and single safety-type lock and handle.

40-Cubic-Yard Drop Box (5):

Dimensions - 22 feet long, 8 feet wide, 8 feet high.
Weight - 9,240 pounds.
Lid Opening - 65 square feet.

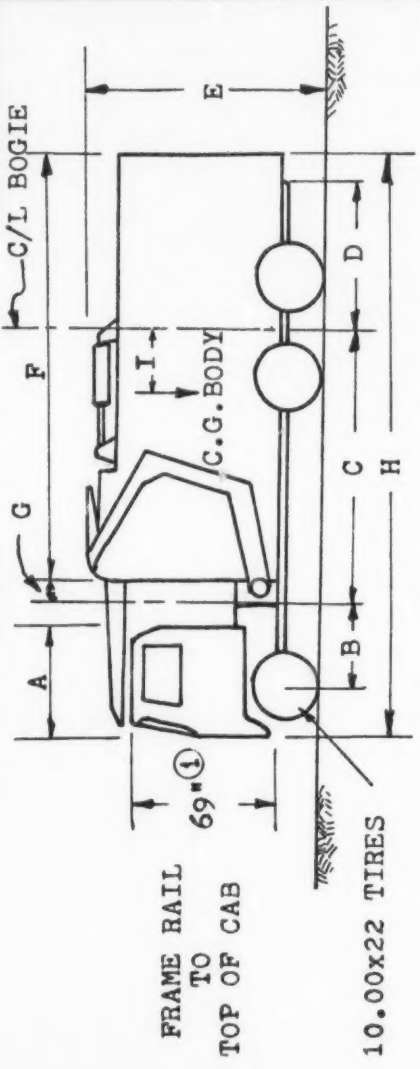
20-Cubic-Yard Drop Box (2):

Dimensions - 22 feet long, 8 feet wide, 4 feet high.
Weight - 5,560 pounds.

8-Cubic-Yard Container (20):

Dimensions - 5.5 feet long, 6 feet wide, 8 feet high.
Weight - 1,480 pounds.
Lid Opening - 18.2 square feet.

CHASSIS NO. 3 MAKE AND MODEL INTERNATIONAL HARVESTER COF 4070 A



REFERENCE	DESCRIPTION	DIMENSION
A.	OVERALL BBC	50"
B.	EFFECTIVE FRONT AXLE TO END OF CAB	38"
C.	USABLE CAB TO TRUNNION REQ'MT	178"
D.	AFTER FRAME REQ'MT	55"
E.	MAX. OVERALL HT.	161"
F.	OVERALL BODY LENGTH	274"
G.	CAB CLEARANCE REQUIREMENTS	3"
H.	OVERALL UNIT LENGTH	348"

SPECIFIED AXLE LOADINGS

	FRONT AXLE (pounds)	REAR AXLE (pounds)	TOTAL (pounds)
CHASSIS ①	8,275	6,716	14,991
UNDERSTRUCTURE ②	1,680	3,360	5,040
FRONT LOADER ③	5,310	9,210	14,520
CONTROLLED PAYLOAD ④	935	12,514	13,449
LEGAL GROSS VEHICLE WT. ⑤	16,200	31,800	48,000

- (1) Maximum road-ready weight per bid (includes 1,035 lbs. of fuel and 3% permissible weight variance).
- (2) Weight of unit, exclusive of chassis, ready to roll (per bid).
- (3) Weight of detachable front loader with packing blade and lifting arms in traveling position (with fluid).
- (4) Distribution of gross controlled payload to respective axles on the basis of water level load.
- (5) Mathematical difference between legal gross vehicle weight and equipment loadings.
- (6) Legal gross vehicle weight, California Vehicle Code, Section 35100, reflects the weight variance for the partial pack option selected by the County:

	F.A.	R.A.	TOTAL
22 Ft. full pack	4,180	11,500	15,680
ADJUSTMENT	1,130	-2,290	-1,160
22 Ft. partial	5,380	9,210	14,520

INTEGRATED CHASSIS, BODY, PAYLOAD, AND DIMENSIONAL CHARACTERISTICS

APPENDIX B

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
NORTH COAST REGION

Order No. 73-14

WASTE DISCHARGE REQUIREMENTS

for

BENBOW SOLID WASTE DISPOSAL SITE
Garberville, Humboldt County

The California Regional Water Quality Control Board, North Coast Region, finds that:

1. The Humboldt County Department of Public Works, 1106 Second Street, Eureka, California 95501, submitted a report of waste discharge dated May 10, 1972, and a site evaluation report dated June 7, 1972.
2. The County of Humboldt is discharging about 4,500 tons per year of Group 2 and 3 wastes in a disposal site located in the S-1/2, SE-1/4, Section 35, T4S, R3E, HB & M, as shown in Attachment "A" incorporated herein and made part of this order. The disposal site is owned by Humboldt County. Expected disposal rate in 1983 is 6,000 tons per year.
3. Current plans are that this 37-acre disposal site will be operated as a sanitary landfill and leachate collection facilities will be provided.
4. The disposal site is situated on a bluff above the South Fork of the Eel River. The disposal area is comprised of shallow deposits of silts, sands, and gravels overlying relatively impervious bedrock. Groundwater resulting from infiltration and subsurface flow occurs above the bedrock. Surface runoff from adjacent land areas can be diverted from the disposal areas.
5. This disposal site can be developed to meet the criteria contained in the California Administrative Code, Title 23, Chapter 3, Subchapter 15, for classification as a Class II-2 Disposal Site suitable to receive Group 2 and Group 3 wastes.

6. Runoff from the disposal area is tributary to the Eel River, which is used in this area for:
 - a) Domestic and municipal water supply
 - b) Water contact recreation
 - c) Aesthetic enjoyment
 - d) Preservation and enhancement of fish and wildlife
7. Land within 1,000 feet of this site is used for water-oriented recreation and grazing.
8. The Interim Water Quality Control Plan for the North Coastal Basin was adopted on December 13, 1972, and this Order implements the water quality objectives stated in the plan.
9. The Board has notified the discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge.
10. The Board in a public meeting heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, the County of Humboldt shall comply with the following:

A. DISCHARGE SPECIFICATIONS

1. The treatment or disposal of waste shall not cause pollution or a nuisance.
2. There shall be no discharge of leachate to the South Fork Eel River or its tributaries.
3. Waste materials shall not be discharged or deposited outside of the designated disposal area shown on Attachment A. No Group 2 or Group 3 wastes shall be placed within 200 feet of the existing bluff line.
4. The disposal area shall be protected from any washout or erosion of wastes or covering material, and from inundation, which could occur as a result of floods having a predicted frequency of once in 100 years.
5. Surface drainage from tributary areas, and internal site drainage from surface or subsurface sources shall be controlled to minimize percolation through Group 2 wastes discharged at the site.
6. Group 1 wastes shall not be deposited at this site.

7. Water used during disposal site operations shall be limited to a minimal amount reasonably necessary for dust control purposes.
8. Liquid control barriers shall be provided to retain leachate from the leachate collection system to prevent any discharge to South Fork Eel River or its tributaries.
9. Annually, prior to the anticipated rainfall period, all necessary runoff diversion channels shall be in place to prevent erosion or flooding of the disposal areas.
10. Hydraulic continuity between leachate storage or disposal facilities and underlying groundwater shall be restricted by placement of an artificial barrier on the base and perimeter of the storage or disposal area capable of reducing infiltration rates to 0.001 gallons / square feet / day or less. Such a barrier must be demonstrated to the satisfaction of this Board's Executive Officer prior to the use of the collection, storage, and disposal facilities.
11. A minimum freeboard of two feet shall be maintained in ponds used for storage or disposal of leachate.
12. No Group 2 wastes shall be placed in ponded water from any source whatsoever.
13. The exterior surfaces of the disposal area shall be graded to promote lateral runoff of precipitation and to prevent ponding, and exterior surfaces which will be exposed for six months or more shall be covered with a minimum of two feet of compacted soil of low permeability.

B. PROVISIONS

1. At this time, Group 2 and 3 solid wastes shall be disposed of only in the area lying west of the existing intermittent stream channel. Future use of other portions of the site as disposal areas may be allowed after revision of the waste discharge requirements which would incorporate experience gained in the initial site operation and evaluation of geological, hydrological, and site development information furnished by the discharger.
2. On or before March 6, 1973, the discharger shall complete surface water interceptor ditch for surface water on northerly and westerly side of disposal area to an elevation two feet below existing refuse.

3. The discharger shall submit a report by May 1, 1973, for review by the Executive Officer which presents a detailed plan for modifying the disposal facilities in order to comply with the above requirements and a time schedule for undertaking such improvements; such plans shall specifically indicate:
 - a. Manner of controlling subsurface drainage from the northwest slope area.
 - b. Manner of controlling subsurface drainage from the northern property boundary area.
 - c. Method of leachate collection under the landfill.
 - d. Leachate handling and disposal methods.
4. Group 2 wastes shall not be disposed of below the invert elevation of the existing drainage channel located at the base of the northwest slope area until the seepage control drains are in place and are operating.
5. Discharge of treated leachate will be considered after satisfactory evidence is submitted by the discharger that pollution or nuisance conditions would not occur.
6. Within 30 days of the completion of installation of subsurface drainage, leachate collection, and leachate treatment facilities, a detailed plan drawing of the disposal site shall be submitted to the Executive Officer for approval, and subsequently shall become a base measurement tool in the monitoring of this disposal site.
7. The discharger shall maintain a copy of this order at the site, available at all times to operating personnel.
8. The discharger shall file with this Board a report of any material change or proposed change in the character, location, or quantity of this waste discharge. For the purpose of these requirements, this includes any proposed change in the boundaries, contours, or ownership of the disposal area(s).
9. The discharger shall comply with the Monitoring Program No. 73-14 as specified by the Executive Officer.
10. Ninety (90) days prior to discontinuing the use of this site for waste disposal the County of Humboldt shall submit a technical report to the Board describing the methods and controls to be used to assure protection of the quality of surface waters of the area during the final operations and with any proposed subsequent use of the land. This report shall be prepared by or under the supervision of a registered engineer or a certified

engineering geologist. The method used to close the site and maintain protection of the quality of surface and groundwaters shall comply with waste discharge requirements established by the Regional Board.

11. This Board considers the property owner to have a continuing responsibility for correcting any problems which may arise in the future as a result of this waste discharge or water applied to this property during subsequent use of the land for other purposes.

Certification

I, David C. Joseph, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an order adopted by the California Regional Water Quality Control Board, North Coast Region on February 28, 1973.

(ORIGINAL SIGNED BY)

David C. Joseph
Executive Officer

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
NORTH COAST REGION

Monitoring and Reporting Program No. 73-14

for

BENBOW SOLID WASTE DISPOSAL SITE
Garberville, Humboldt County

MONITORING

1. Three monitoring wells shall be installed in locations approved by the Executive Officer in a position to detect possible southward movement of leachate from the initial landfill area. One of the wells shall be located in the vicinity of the stream channel.
2. Provisions shall be made to allow measurement of the flow rate of leachate drained from the landfill area.
3. On the first working day of each month the discharger shall perform an inspection of the disposal site and the following items reported on:
 - a. Are the subsurface seepage drains functioning properly?
 - b. Are surface runoff diversion facilities in place?
 - c. Effectiveness of control system; compute total leachate flow from the landfill.
 - d. Note location of springs and any apparent discoloration due to leachate sources.
 - e. (An additional item will be added to include surveillance of leachate handling and disposal after that system is prepared by the discharger.)

REPORTING

The quarterly monitoring reports shall be submitted to the Regional Board by the 15th day of the succeeding reporting period. The first reporting period will commence May 1, 1973. The monthly observation reports shall be submitted with the quarterly reports.

An annual report shall be submitted by January 31st of each year updating the disposal site plan drawing (per Provision No. 6, Order 73-14) to show

the total areas used for waste disposal relative to a permanent monument at the site and to include approved changes in the disposal facilities. The first annual report will be due January 31, 1974.

Ordered by (ORIGINAL SIGNED BY)

David C. Joseph
Executive Officer
February 28, 1973

APPENDIX C

EXTENSIVE SANITARY LANDFILL - OPERATIONAL AND COST DATA

Month	Solid Waste Quantities (tons)				Monthly Total	Equipment		Man- Hours	Cost					Efficiency Factors			
	County Collected	Franchise Collected	State Parts	Other		Hours	Hours		Equipment (1)	Labor (2)	Land (3)	Site Development (4)	Misc. (5)	Total Monthly Cost	Actual Cost (\$/ton)	Equipment (hrs/ton)	Labor (hrs/ton)
Aug., 1972	222	148	38	115	523	94	121	\$ 1,732	\$ 908	\$ 1,121	\$ 806	\$ -	\$ 4,567	\$ 8.73	0.18	0.23	\$ 7.76
September	197	114	15	145	471	102	117	1,767	878	1,121	806	-	4,572	9.71	0.22	0.25	8.75
October	188	94	4	1	297	76	115	1,732	862	1,121	806	-	4,521	15.22	0.26	0.39	12.76
November	153	83	5	2	243	65	190	1,732	1,425	1,121	806	-	5,084	20.92	0.27	0.78	17.61
December	129	74	1	4	208	47	106	1,732	795	1,121	806	-	4,454	21.41	0.22	0.51	16.19
Jan., 1973	171	78	1	3	253	20	85	1,732	638	1,121	806	-	* 4,297	16.98	0.08	0.34	11.35
February	181	82	7	2	272	34	87	1,732	652	1,121	806	-	4,311	15.85	0.12	0.32	11.23
March	201	81	13	2	297	39	128	1,732	960	1,121	806	-	4,619	15.55	0.13	0.43	11.63
April	194	80	6	-	280	55	98	1,732	735	1,121	806	-	4,394	15.69	0.20	0.35	12.13
May	198	114	12	-	324	77	146	1,732	1,095	1,121	806	25	4,779	14.75	0.24	0.45	12.53
June	205	119	13	124	461	105	154	1,732	1,155	1,121	806	25	4,839	10.50	0.23	0.33	9.68
July	222	155	24	-	401	115	189	1,732	1,418	1,121	806	25	5,102	12.73	0.29	0.47	12.15
August	204	200	40	-	444	126	184	1,732	1,380	1,121	806	25	5,064	11.40	0.28	0.41	11.17
September	151	123	14	-	288	79	178	1,732	1,335	1,121	806	25	5,019	17.43	0.27	0.62	15.10
October	180	106	6	-	292	104	196	-	1,732	1,470	806	25	5,154	17.65	0.36	0.67	16.43
November	171	122	3	-	296	55	150	1,732	1,125	1,121	806	25	4,809	16.25	0.19	0.51	12.93
December	130	80	2	-	212	59	224	1,732	1,680	1,121	806	25	5,364	25.30	0.28	1.06	21.17
Total	3,107	1,853	204	398	5,562	1,252	2,468	\$29,479	\$18,511	\$19,057	\$13,702	\$200	\$80,949	\$14.55	0.22	0.44	\$12.26
Monthly Average	183	109	12	23	327	74	145	\$ 1,734	\$ 1,089	\$ 1,121	\$ 806	\$ 12	\$ 4,762				

(1) D-6 Bulldozer lease: \$17,325/hour; 100 hour/month minimum. During 1973, fixed rate of \$1,732.50/month.

(2) \$7.50/hour; includes wage and overhead.

(3) \$75,000 amortized at 6% for 7 years; \$75,000 x 0.179135 = \$13,435/year (\$1,121/month).

(4) Initial site development of \$54,000 amortized at 6% for 7 years; \$54,000 x 0.179135 = \$9,673/year (\$806/month).

(5) Surface interceptor trench construction in May, 1973: \$1,686 amortized at 6% for 7 years; \$1,686 x 0.179135 = \$302/year (\$25/month).

(6) Based on (1) assumed equipment cost of \$12/hour that bulldozer is in use, (2) labor cost increased by 10.3% to reflect non-productive paid time, and (3) other cost components remain the same.

APPENDIX D

DATA COLLECTION FORMS

D-1

Humboldt County, California SOLID WASTE DEMONSTRATION PROJECT Collection Trip Ticket

Form No. D-1

(To be filled out for each separate trip)

Trip ticket no. 1-2		Scheduled: ()		Non-scheduled: ()		9	
Date: 3-8		mo. day yr. 10-13		Driver:			
Truck no.		System (8, 20, or 40 cy):		No. of tilt cycles:		16	
Container no. out:		Container no. in:		Weight in:		26-30	
Weight out:		21-25		26-30			

Site no.	Mileage		Time		Collection activity elapsed time (minutes)					Estimated volume							
	arrive	depart	arrive	depart	Site cleanup	Loading/transfer	Contain. washing	Other* (descr.)	Refuse unload	Weight & service	1+	1	.75	.5	.25	0	
SLF		31-35									8	8	8	8	8	40	20
36					37-38	39-40	41-42	43-45			9-11	12-14	15-17	18-20	21-23	24-26	27-29
46					47-48	49-50	51-52	53-55			30-32	33-35	36-38	39-41	42-44	45-47	48-50
56					57-58	59-60	61-62	63-65			51-53	54-56	57-59	60-62	63-65	66-68	69-71
SLF	66-70										Total (min): 75-77						

Site Conditions																	
Site no.	Refuse type	Non-users	Rating		Comments (check maximum of three comments per site)												
			Litter	Spillage	Vectors	I	F	V	R	I	A	D	C				
	9-11	12-13	14	15	16												
	20-22	23-24	25	26	27												
	31-33	34-35	36	37	38												
Non-project time (min): 42-44			Remarks concerning non-project trips: 45-79			3											

Comments

L - open lids R - rodents D - damaged lid
F - fire I - insects C - container
V - vandalism A - animals damaged

Ratings: 1 - good, 2 - fair, 3 - poor

Litter: Refuse on site, except spillage and non-users

Spillage: Refuse around containers

Vectors: Bees, flies, animals, etc.

Refuse type: H - household D - demolition C - construction
F - furniture A - appliances T - tires
B - brush O - other

Non-users: Estimate number

COUNTY OF HUMBOLDT * SOLID WASTE DEMONSTRATION PROJECT * FORM NO. D-3
 WEEKLY TIMECARD * To Be Filled Out Daily By Each Employee And Turned In Weekly
 EMPLOYEE: _____

EMPLOYEE:	DESCRIPTION	Week Ending Saturday: 19														Rate:	OFFICE USE
		SUN		MON		TUE		WED		THU		FRI		SAT			
		Hrs	Min	Hrs	Min	Hrs	Min	Hrs	Min	Hrs	Min	Hrs	Min	Hrs	Min		
SOLID WASTE DEMONSTRATION PROJECT TIME	Route Time																
	Collection Activity Time - 8 CY																
	Collection Activity Time - 40CY																
Landfill	Joint Collection Time																
	Repairs and Maintenance																
	Administration or Other																
Other	SUBTOTAL COLLECTION TIME																
	Equipment Operation																
	Traffic Supervision																
TIME	Site Maintenance																
	Equipment Repairs and Maint.																
	Administration or Other																
	SUBTOTAL LANDFILL TIME																
	Safety Meetings and Education																
	Administration																
	Idle Time																
	.																
	Other																
	SUBTOTAL OTHER PROJECT TIME																
	Garberville Collection&Disposal																
	SUBTOTAL NON-PROJECT TIME																
	TOTALS																

NOTE: Show Time to Nearest 5 Min. APPROVED BY: _____

COUNTY OF HUMBOLDT * SOLID WASTE DEMONSTRATION PROJECT

WEEKLY LANDFILL EQUIPMENT REPORT * To Be Completed By Landfill Supervisor And Turned In Weekly	Equipment No:	* Week Ending Saturday:	19	* Hours Begi	Hours End

Equipment No:

[illegible]

- (1) T-Trenching, S-Stockpiling, R-(Onsite) Roads, D-Drainage, C-Cleanup, O-Other.
- (2) Enter Diesel Fuel Service opposite appropriate machine HOURS entry, when possible.
- (3) Describe special operating problems, including: water table, difficult soils, soils classification, etc.

Approved by:

APPENDIX E

TYPICAL DATA SUMMARY

HUMBLT.336001.1.50

20 NOV 73 09103141 PAGE 11

HUMBOLDT COUNTY, CALIFORNIA - SOLID WASTE DEMONSTRATION PROJECT
TRIP TICKET SUMMARY BY TYPE OF SYSTEM
PERIOD: AUGUST 1973

DATE	TRIP	8 CY-SCHE	CHASSIS	NO.	8 CY-OR	NUMBER	OF	NO.	IN	TRIP	STRIP	SITE	LOAD	WGIN	OTHER	SUB	PUNT	UNLOAD	REFUSE	PAGES	3	NON-	NON-	PROJ	TIME	USERS	TIME	(MIN)
8/25/73	83	40	610	3	640D	3.31	59	2.09	15	15	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
8/25/73	84	40	611	3	640	2.91	115	4.42	15	15	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
8/25/73	85	20	610	3	640	1.14	23	1.17	10	15	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
8/26/73	86	20	610	2	610	1.00	22	1.84	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/26/73	87	8	611	3	610	1.10	57	3.84	20	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/26/73	88	20	610	3	610	.75	23	1.25	10	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/26/73	89	20	610	2	610	1.05	17	1.42	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/27/73	90	20	610	3	610	.95	17	1.00	10	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/27/73	91	8	611	3	640	2.05	35	2.42	35	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/27/73	92	40	610	3	640	1.05	46	2.00	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/73	93	20	611	3	640	1.00	20	1.25	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/73	94	40	610	3	640B	.65	112	4.00	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/73	95	40	610	3	640A	4.38	54	1.84	10	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/29/73	96	20	611	3	610	1.38	14	1.25	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/29/73	97	20	611	2	610	1.20	15	1.09	30	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/29/73	98	8	611	3	610	3.50	51	3.17	20	30	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/30/73	99	20	610	2	610	1.15	18	1.25	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/30/73	0	20	610	3	610	1.84	16	3.50	60	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/31/73	1	20	610	2	610	1.00	17	1.09	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/31/73	2	20	610	3	610	1.35	18	1.84	10	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/31/73	3	8	611	3	610	2.05	35	3.84	10	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 CY SYSTEM	18			51		44.90	869	58.34	490	345	50	0	14.8	43.59														
40 CY SYSTEM	22			63		58.09	1617	63.25	455	310	0	0	12.8	50.50														
20 CY SYSTEM	63			152		78.28	1046	85.59	1100	860	0	0	32.7	52.92														
NON-PROJECT	0			0																								

REFUSE TYPE: M--HOUSEHOLD C--CONSTRUCTION T--TIRES F--FURNITURE B--BRUSH D--OTHER D--DEMOLITION A--APPLIANCES
NON-USERS: 1 ESTIMATED NUMBER

APPENDIX F

CONTAINER WASTE DENSITY

	<u>8-Cubic-Yard System</u>			<u>40-Cubic-Yard System</u>		
	<u>Waste Quantity</u>		<u>Density</u>	<u>Waste Quantity</u>		<u>Density</u>
	<u>tons*</u>	<u>cubic yards**</u>		<u>tons*</u>	<u>cubic yards**</u>	
August, 1972	42.16	740	114	58.34	620	188
September	38.20	644	119	43.44	530	164
October	40.02	511	157	34.10	400	170
November	34.10	422	162	40.11	340	236
December	32.12	336	191	24.33	220	221
January, 1973	57.05	470	243	31.59	295	214
February	47.20	406	233	43.72	270	324
March	59.15	386	306	47.98	380	253
April	51.08	448	231	53.90	430	251
May	39.03	350	223	74.90	875	171
June	29.20	470	124	77.35	1040	149
July, 1973	36.98	688	108	83.17	980	170
August	44.90	732	123	58.09	736	158
September	33.21	494	134	49.33	860	115
October	36.65	444	165	59.61	670	178
November	30.15	262	230	40.91	340	241
December	27.38	182	301	40.06	380	211
Total	678.58	7,985	170 (Ave.)	860.94	9,366	184 (Ave.)

* Weighed.

** Estimates based on proportion of container filled.

APPENDIX G
COLLECTION VEHICLES' OPERATING COST

Cost Category	Quarterly Reporting Period 1972 - 73												Project Total	
	July - September		October - December		January - March		April - June		July - September		October - December		July, 1972 - December, 1973	
	Total Cost	Unit Cost (\$/mile) (1)	Total Cost	Unit Cost (\$/mile) (2)	Total Cost	Unit Cost (\$/mile) (3)	Total Cost	Unit Cost (\$/mile) (4)	Total Cost	Unit Cost (\$/mile) (5)	Total Cost	Unit Cost (\$/mile) (6)	Total Cost	Unit Cost (\$/mile) (7)
Battery	\$ 33	\$ 0.002	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 27	\$ 0.002	\$ 60	\$ 0.001
Tires	916	0.047	426	0.052	529	0.074	1,105	0.143	1,695	0.146	617	0.055	5,288	0.081
Fuel	331	0.017	295	0.036	246	0.034	281	0.036	594	0.044	457	0.041	2,114	0.032
Lubricants	19	0.001	282	0.035	251	0.035	25	0.003	194	0.017	432	0.038	1,203	0.018
Preventative Maintenance	318	0.016	39	0.005	457	0.064	48	0.006	186	0.016	42	0.004	1,090	0.017
Washing & Cleaning	30	0.001	37	0.004	52	0.007	23	0.003	88	0.008	-	-	230	0.004
Transportation of Equipment	29	0.001	-	-	-	-	19	0.002	14	0.001	19	0.002	81	0.001
Fabrication & Welding	-	-	-	-	134	0.019	28	0.004	145	0.012	208	0.018	515	0.008
Repairs	1,299	0.066	714	0.088	1,744	0.243	3,407	0.439	2,334	0.202	1,866	0.166	11,364	0.173
Total	\$ 2,975	\$ 0.151	\$ 1,793	\$ 0.220	\$ 3,413	\$ 0.476	\$ 4,936	\$ 0.636	\$ 5,160	\$ 0.446	\$ 3,668	\$ 0.326	\$ 21,945	\$ 0.335
														100.0%

-
- (1) 19,652 miles.
 - (2) 8,139 miles.
 - (3) 7,166 miles.
 - (4) 7,766 miles.
 - (5) 11,578 miles.
 - (6) 11,268 miles.
 - (7) 65,569 miles.

APPENDIX H

8 CUBIC YARD CONTAINER COLLECTION SYSTEM - OPERATIONAL AND COST DATA

Month	Weight Collected (tons)	Vehicle Miles	Labor (man-hours) (1)	Capital Cost Amortization					Variable Cost					Total Monthly Cost	Efficiency Factors		Adjusted Cost (\$/ton) (9)	
				Sites (2)	Collection Vehicle (3)	Compaction Body (4)	Containers (5)	Sub-total	Site Maintenance	Collection Vehicle (6)	Compaction Body (7)	Containers (7)	Labor (8)		Sub-total	Cost (\$/ton)		Labor (hrs/ton)
Aug., 1972	46.2	1,078	84.0	\$ 615	\$ 208	\$ 158	\$ 121	\$ 1,102	\$ -	\$ 163	\$ 36	\$ 22	\$ 630	\$ 1,953	\$42.27	1.82	\$46.21	
September	38.2	953	68.6	615	184	158	121	1,078	-	144	36	22	514	1,794	46.96	1.80	50.85	
October	40.0	873	61.4	615	168	158	121	1,062	-	192	24	2	460	1,740	43.50	1.54	46.82	
November	34.1	713	48.4	615	138	158	121	1,032	-	157	24	2	363	1,578	46.28	1.42	49.35	
December	32.1	577	33.2	615	111	158	121	1,005	-	127	24	2	249	1,407	43.83	1.03	46.07	
Jan., 1973	57.0	633	47.0	615	122	158	121	1,016	-	301	90	-	352	1,759	30.86	0.82	32.64	
February	47.2	445	28.7	615	86	158	121	980	200	212	90	-	215	1,697	35.95	0.61	37.27	
March	59.2	403	28.5	615	78	158	121	972	-	192	90	-	214	1,668	24.80	0.48	25.84	
April	51.1	524	37.4	615	101	158	121	995	-	333	597	10	280	2,215	43.35	0.73	44.93	
May	39.0	558	36.6	411	108	158	121	798	-	355	597	10	274	2,035	52.18	0.94	54.21	
June	29.2	501	36.6	411	97	158	121	787	-	319	597	10	274	1,987	68.05	1.25	70.76	
July	37.0	1,020	57.9	615	197	158	121	1,091	-	455	58	105	434	2,143	57.92	1.56	61.31	
August	44.9	869	58.3	615	168	158	121	1,062	-	388	58	105	437	2,050	45.66	1.30	48.47	
September	33.2	720	43.5	615	139	158	121	1,033	-	321	58	105	326	1,843	55.51	1.31	58.35	
October	36.6	725	50.3	615	140	158	121	1,034	-	236	10	27	377	1,684	46.01	1.37	48.99	
November	30.2	629	40.3	615	121	158	121	1,015	-	205	10	27	302	1,559	51.62	1.33	56.51	
December	27.4	639	43.7	615	123	158	121	1,017	-	208	10	27	328	1,590	58.03	1.59	61.49	
Total	682.6	11,860	804.4	\$10,047	\$2,289	\$2,686	\$2,057	\$17,079	\$200	\$4,308	\$2,409	\$476	\$6,029	\$13,423	\$30,502	\$44.68	1.18	\$47.24
Monthly Average	40.2	698	47.3	\$ 591	\$ 135	\$ 158	\$ 121	\$ 1,005	\$ 12	\$ 253	\$ 142	\$ 28	\$ 355	\$ 790	\$ 1,794			

- (1) Direct collection time; does not include idle time, instruction time, and other non-productive time.
- (2) Average container site cost is \$28,200. Amortization of 3 sites for 20 years at 6%: $\$28,200 \times 0.0871846 = \$2,457$ / month.
- (3) \$29,595 less 10% salvage value, amortized at 6% for 7 years: $(\$29,595 - \$2,960) \times 0.179135 = \$4,771$ / year. At 25,000 miles / year, amortization is \$0.193 / mile.
- (4) \$12,935 less 10% salvage value, amortized at 6% for 8 years: $(\$12,935 - \$1,294) \times 0.161036 = \$1,875$ / year. At 25,000 miles / year, amortization is \$0.193 / mile.
- (5) Amortization of 20 containers at \$8,925 for 8 years at 6%: $\$8,925 \times 0.161036 = \$1,437$ / year (\$121 / month).
- (6) Based on quarterly unit vehicle costs.
- (7) Repairs and maintenance cost averaged over quarterly reporting period.
- (8) \$7.50 / hour; includes wage and overhead.
- (9) Labor increased 28.9% to reflect non-productive paid time. Other cost components unchanged.

APPENDIX I

40 CUBIC YARD CONTAINER COLLECTION SYSTEM - OPERATIONAL AND COST DATA

Month	Weight Collected (tons)	Vehicle Miles	Labor (manhours)	Capital Cost Amortization				Variable Cost			Total Monthly Cost	Efficiency Factors		
				Sites (2)	Collection Vehicles (3)	Containers (4)	Sub-total	Collection Vehicles (5)	Containers (6)	Labor (7)		Cost (\$/ton)	Factors (hrs./ton)	Adjusted Cost (\$/ton) (8)
Aug., 1972	54.0	1,550	92.0	\$ 615	\$ 299	\$ 185	\$ 1,099	\$ 234	\$ 65	\$ 690	\$ 2,088	\$38.67	1.70	\$42.36
September	43.4	1,525	79.0	615	294	185	1,094	230	65	592	1,981	45.65	1.82	49.59
October	34.1	1,241	65.3	615	240	185	1,040	273	169	490	1,922	57.83	1.91	61.98
November	40.1	999	51.7	615	193	185	993	220	169	388	1,770	44.14	1.29	46.94
December	24.3	660	34.0	615	127	185	927	145	169	255	1,496	61.56	1.40	64.60
Jan., 1973	31.6	849	40.8	615	164	185	964	404	-	306	1,674	52.97	1.29	55.77
February	43.7	595	27.2	615	115	185	915	283	-	204	1,402	32.08	0.62	33.43
March	48.0	909	37.0	615	175	185	975	433	-	378	1,786	37.21	0.77	39.48
April	53.9	1,151	47.3	615	222	185	1,022	732	28	355	2,137	39.65	0.88	41.55
May	74.9	1,590	76.4	820	307	185	1,312	1,011	28	573	2,924	39.04	1.02	41.25
June	77.4	1,760	88.1	820	340	185	1,345	1,119	28	661	3,153	40.74	1.14	43.20
July	83.2	1,727	86.8	615	333	185	1,133	770	54	651	2,608	31.35	1.04	33.61
August	58.1	1,617	63.3	615	312	185	1,112	721	54	475	2,362	40.65	1.09	43.02
September	49.3	1,848	72.5	615	357	185	1,157	824	54	544	2,579	52.31	1.47	55.50
October	59.6	2,062	92.8	615	398	185	1,198	672	53	696	2,619	43.94	1.56	47.32
November	40.9	1,284	58.5	615	268	185	1,048	419	53	439	1,959	47.90	1.43	51.00
December	40.1	1,208	51.4	615	233	185	1,033	394	53	386	1,856	46.53	1.28	49.32
Total	856.6	22,575	1,064.1	\$10,865	\$4,357	\$3,145	\$18,367	\$8,894	\$1,042	\$8,083	\$36,376	\$42.47	1.24	\$45.19
Monthly Average	50.4	1,328	62.6	\$ 639	\$ 256	\$ 185	\$ 1,080	\$ 522	\$ 61	\$ 475	\$ 2,140	\$ -	-	-

- (1) Direct collection time; does not include idle time, instruction time, and other non-productive time.
 (2) Average container site cost is \$8,200. Amortization of 3 sites for 20 years at 6%: $\$8,200 \times 0.0871846 = \$7,376$ / year (\$615 / month). For May and June, 4 sites used 40 cubic yard containers.
 (3) \$29,595 less 10% salvage value, amortized at 6% for 7 years: $(\$29,595 - \$2,960) \times 0.179135 = \$4,771$ / year. At 25,000 miles / year, amortization is \$0.193 / mile.
 (4) Amortization of 5 containers at \$13,640 for 8 years at 6%: $\$13,640 \times 0.161036 = \$2,197$ / year (\$185 / month)
 (5) Based on quarterly unit vehicle costs.
 (6) Repairs and maintenance cost averaged over quarterly reporting period.
 (7) \$7.50 / hour; includes wage and overhead.
 (8) Labor increased 28.9% to reflect non-productive paid time. Other cost components unchanged.

APPENDIX J

SUMMARY OF SITE SURVEYS

	D a t e s o f F i e l d S u r v e y s					
	April 2 - 4, 1971 ⁽¹⁾		April 6 - 8, 1973 ⁽²⁾		October 5 - 7, 1973 ⁽³⁾	
Total Vehicle Usage	92		164		206	
Vehicle Arrival Time						
Range	9:30 am - 4:15 pm		8:45 am - 6:24 pm		8:15 am - 5:45 pm	
Mode	11:00 am - 12:00 pm		11:00 am - 12:00 pm		12:00 pm - 1:00 pm	
Unloading Time (minutes)						
Mean	7.3		9.9		6.0	
Mode	5 - 7		5		5	
Vehicle Type (%)						
Sedan	21.4%		21.2%		15.6%	
Station Wagon	5.4%		9.9%		10.6%	
Trailer	1.0%		2.5%		1.0%	
Pickup Truck & Light Truck	65.5%		65.8%		66.5%	
Heavy Truck	4.3%		-		1.5%	
Other	2.4%		0.6%		4.8%	
Vehicle Driver Age (%)	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
16 to 35	39.1	14.1	37.2	9.3	40.7	9.5
36 to 55	28.3	8.7	28.0	4.4	27.7	8.0
55 plus	8.7	1.1	17.4	3.7	13.1	1.0
	Total - 103		Total - 159		Total - 138	
Vehicle Passenger Age (%)	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
0 to 9	19.4	12.6	18.9	10.6	18.1	8.7
10 to 15	15.6	4.8	5.0	5.0	7.3	2.2
16 to 35	22.4	13.6	12.6	23.2	21.7	26.1
36 to 55	3.9	4.8	2.5	10.0	5.8	6.5
55 plus	1.9	1.0	5.6	6.6	1.4	2.2
Mean Travel Distance to Site (miles)	-		5.3		5.9	
Mean Travel Time to Site (minutes)	-		11.4		13.6	
Mean Frequency of Use (times/month)	-		4.05		3.9	
Mean Household Size	-		3.45		4.5	
All Waste Brought to This Site?						
Yes	-		58.4%		65.7%	
No	-		41.6%		34.3%	
Franchised Collector in Your Area?						
Yes	-		15.6%		33.5%	
No	-		84.4%		66.5%	

- (1) Prior to container site development. Disposal by open dumps.
 (2) Container collection system in operation for eight months.
 (3) Type of containers at four sites interchanged on July 1, 1973